Pit and Quarry

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Reaches Largest Number of Plants

Vol. XIX | MARCH 26, 1930 | No. 13

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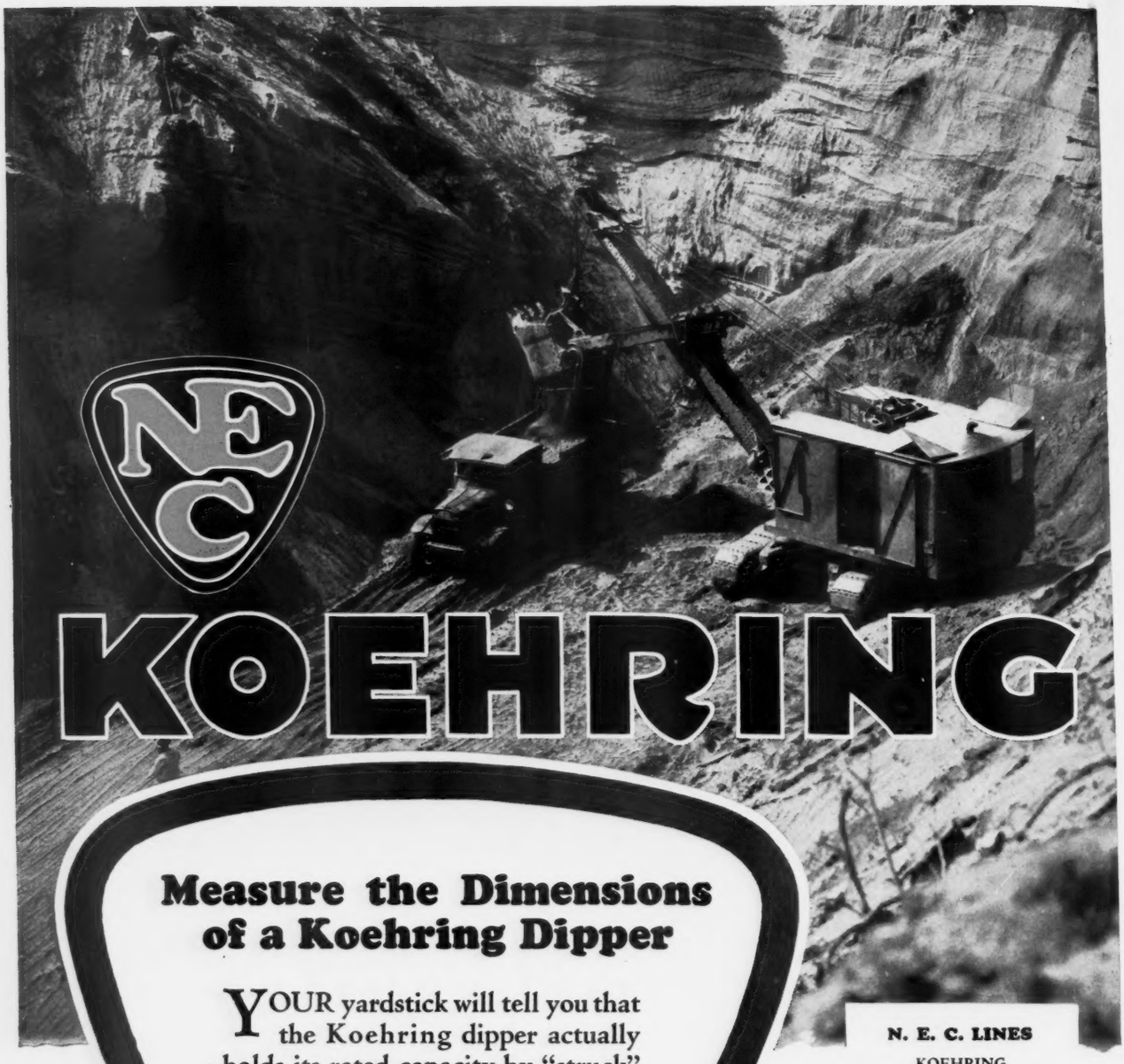

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Reaches Largest Number of Plants

Published Biweekly on Wednesday for Producers and Manufacturers of Sand, Gravel, Stone, Cement, Gypsum, Lime, and Other Non-Metallic Minerals.

Subscription price: $5 for 3 years, $2 for 1 year in the United States and possessions, North, Central and South America; elsewhere $1 additional for each year. Single copies 20c.

Entered as second-class matter October 9, 1928, at the Post Office at Chicago, Illinois, under the Act of March 3, 1879.

Published and copyrighted, 1930, by the

COMPLETE SERVICE PUBLISHING COMPANY

538 South Clark Street, Chicago, Illinois

H. W. BAUMGARTNER, *President* — V. E. LARSEN, *Vice-President*

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CEMENT-MILL & QUARRY

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Marquette Cement Mfg. Co. Speeds Up Service by New Distributing System

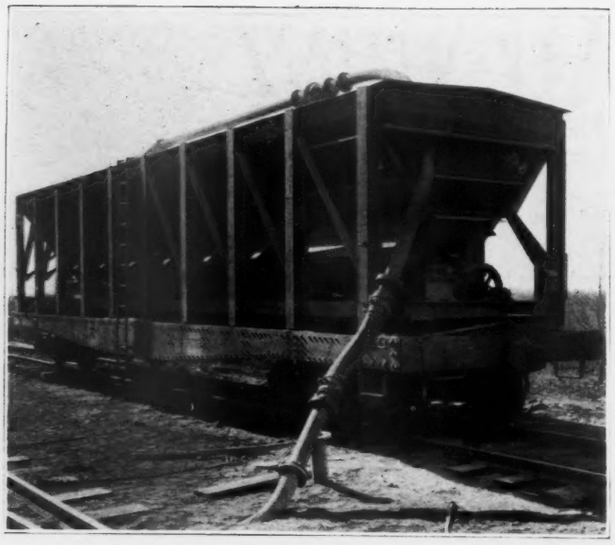
Self-Unloading Bulk Cement Barges Deliver to Silos and Packing Plants at Memphis and St. Louis from Plant at Cape Girardeau, Mo.

THE Marquette Cement Manufacturing Company, late in the summer of 1929, put into operation a very efficient and economical system of cement transportation, storage and packing. Self-unloading bulk cement barges, the first to operate on the Mississippi River, haul cement from the plant at Cape Girardeau, Mo., to storage and packing plants at St. Louis, Mo., and Memphis, Tenn. Through this system the service into the sales territory of the plant has been materially speeded up.

The cement plant at Cape Girardeau is one of the pioneer operations in the Mississippi Valley. Constant changes and additions, however, have kept it abreast of the times in modern practice. Very few changes had to be made to accommodate the new transportation system. The dock at which the self-unloading barges are loaded is the same one that was built to load sacked cement on ordinary barges for shipment. Shipments to points other than those near St. Louis or Memphis are yet being made in this manner.

A 6-in. Fuller-Kinyon pump at the plant loads the cement into specially-designed bulk cement hopper cars with a capacity of 400 bbl. each. The loading pipe which runs lengthwise over the center

Some of the self-unloading bulk cement barges operated by the Marquette Cement Mfg. Co.



A special bulk cement car being loaded at the Cape Girardeau plant

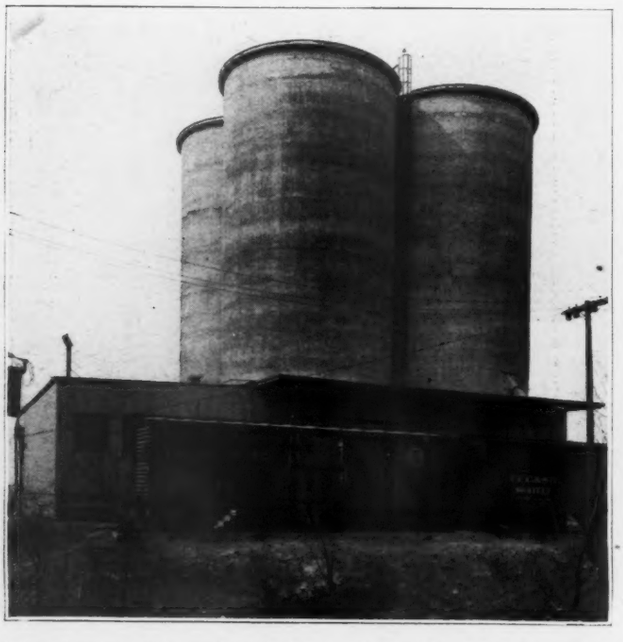
of the car is connected by a rubber hose coupling to a stationary loading pipe alongside the track. The loaded cars are then hauled a distance of ½ mile to the dock.

The car is then run into an enclosure and connected to the electrical circuit at the dock. A longitudinal screw conveyor under each car hopper feeds the cement to a 6-in. Fuller-Kinyon pumping system which conveys it through a pipe line to the barges. The screw conveyor is driven through chain and a James spur-gear speed reducer by an electric motor.

The four barges, which have a capacity of 800 tons each, were built by the Riter-Conley Company. They are of all-steel construction, 175 ft. long by 35 ft. wide and 8 ft. deep, greatly resembling a standard river barge in outward appearance. The storage space, consisting of three longitudinal hopper bottom bins running the entire length of the barge between the end bulkheads, is filled through a system of pipes and valves above the deck. In addition to the collision bulkheads at each end, there are wing bulkheads on each side running the entire length of the barge. Each of these is divided into six water-tight compartments. All seams and joints are welded to insure water-tightness and every precaution has been taken to prevent spray and wave wash from entering the hoppers and damaging the cargo.

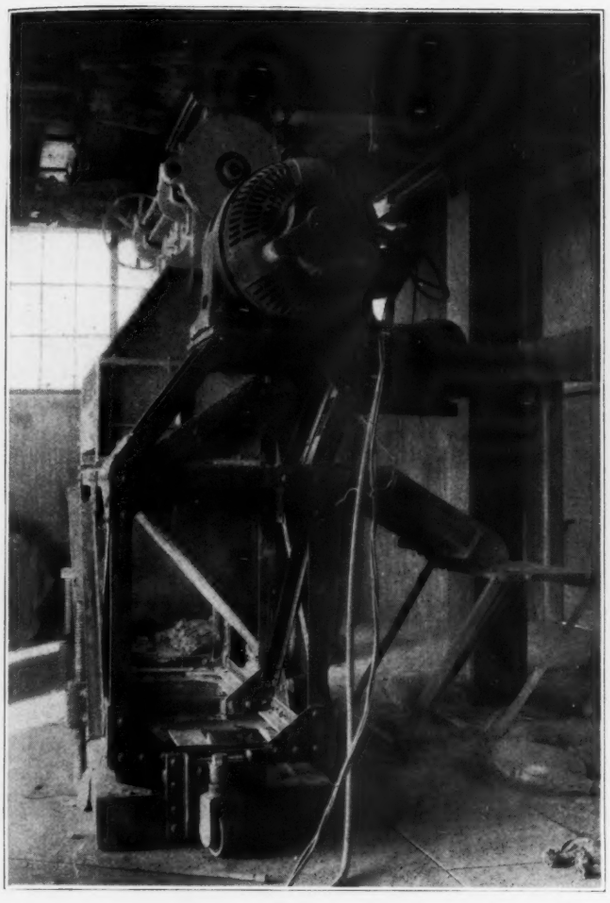
The self-unloading barges are pushed, one or two at a time, to one of the new distributing plants at Memphis or St. Louis. A chartered 300-hp. steam towboat is being used at present but this will be replaced in the summer by a new 800-hp. Diesel-driven towboat which is now under construction. This system of hauling has been planned in such a way that all of the equipment is kept in constant operation with no costly delays. One barge is loaded at the plant while two are being unloaded at the terminals and the fourth is enroute to one or the other of the terminals.

One of the bulk cement cars being unloaded at the dock



The storage silos and pack-house at the St. Louis terminal

The unloading mechanism on each barge is extremely simple. Six 9-in. screw conveyors, extending the entire length of each hopper to the center of the hold, discharge into a 12-in. cross conveyor. The 9-in. conveyors are individually driven by 7½-hp. electric motors through James herringbone-gear speed reducers. The cross conveyor, which is a single unit driven by a 5-hp. electric motor through chain and speed reducer, has right-hand flights on one half and left-hand on the other. It



The portable packer of the Memphis plant. Note sliding gate above

discharges at its center to a 6-in. Fuller-Kinyon pump. No trouble is experienced in cleaning out the bins when unloading as the lack of depth in the compartments keeps the cement from compacting.

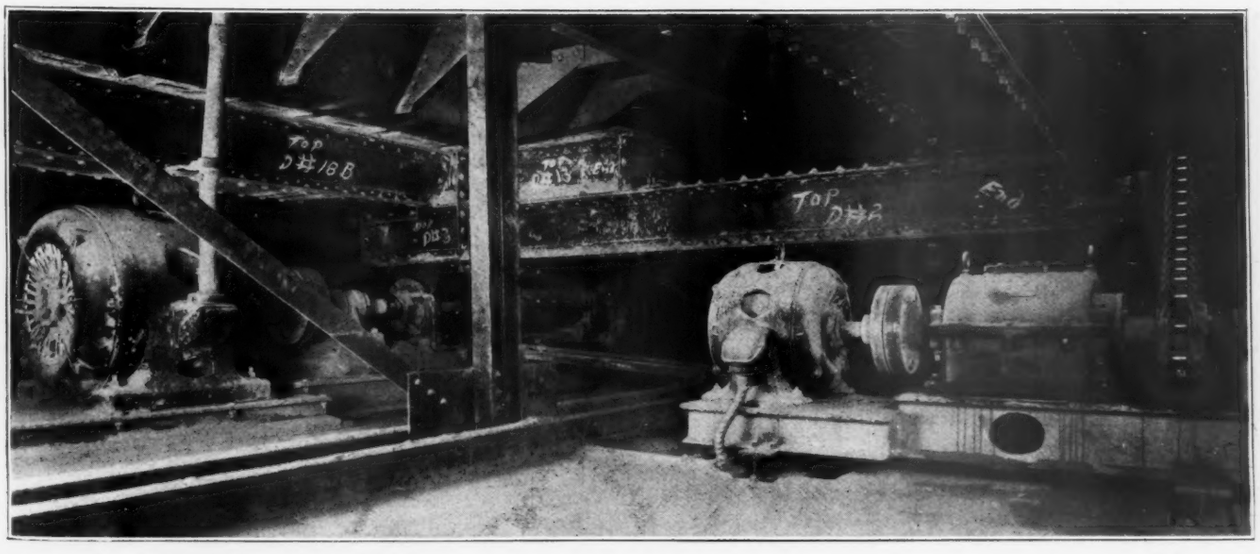
The pump discharges through a pipe line to either side of the barge for unloading at the terminals, attaching to the shore line by means of a

The car loading side of the Memphis silos and pack-house

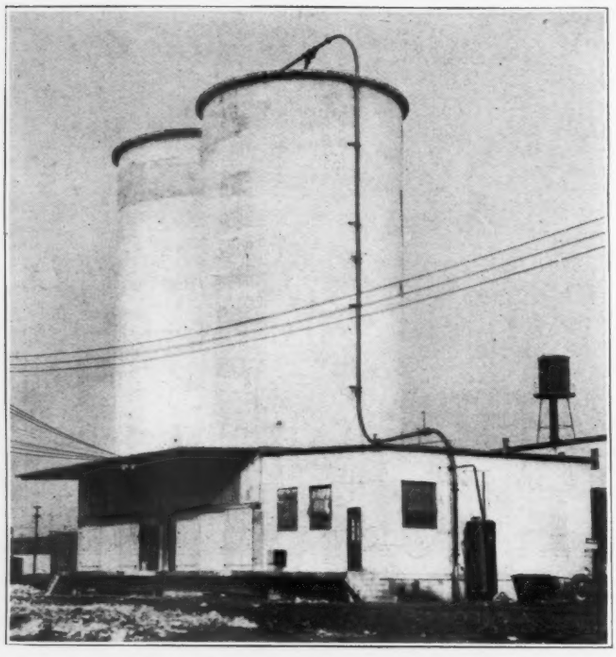
flexible hose coupling. Electricity for the motors, compressed air for the Fuller-Kinyon pump, and electric lighting current are also secured by connection with shore lines.

Both of the terminals are of the same general type of construction, consisting of concrete storage silos built over a base forming the packing room. The Memphis terminal has two silos with a total capacity of 15,000 bbl. while the St. Louis terminal has four silos and a star bin with a total capacity of over 30,000 bbl. Both are designed so that more silos can be added at any time. The St. Louis unit also has double the packing capacity of the Memphis unit. The St. Louis terminal is at the foot of Malt Street about 3 miles from the business center.

The Memphis terminal is located on the bank of Wolf River about ¼ mile above its junction with the Mississippi River and ½ mile from the center of the city. The packing room under the silos con-



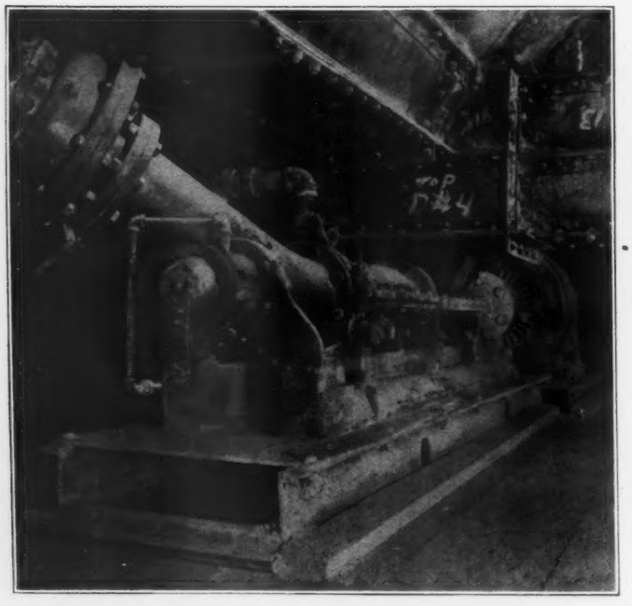
Interior of one of the barges showing cement pumping unit at left and drive of one of cross conveyors at right



Truck loading side of Memphis terminal

tains a movable Bates 3-bag packer which can be moved to any one of four outlets under the two silos. The packer is driven by a direct-connected 25-hp. Wagner electric motor. The gates are operated from the ground level by chain. The packed cement is loaded by means of hand trucks into railroad cars on one side of the packhouse or trucks on the other side. The floor of the packing room is at car and truck level which greatly facilitates loading.

In addition to the packing room there is a small office for the superintendent and a compressor room. A Sullivan compound 13-in. by 8-in. by 8-in. air compressor furnishes air for operating the Fuller-Kinyon pumps on the barges. This is driven through Texrope drive by a 75-hp. General Electric motor and is equipped with a Mid-West air filter on the intake. A General Electric automatic pressure governor controls the compressor.



A closeup of one of the pumping units used on the barges

Blasting Caps Cause Suffering for Many Children

Miners, quarrymen and other users of explosives, do your share to prevent children from being injured by playing with blasting caps. The average man does not want to harm a child. Yet, thoughtlessness or carelessness on the part of men who handle explosives is indirectly responsible for practically all the blasting cap accidents which annually injure—and, in some cases, kill—several hundred children.

Almost wholly, the accidents are due to the fact that the users of blasting caps neglect to put these articles in safe places where they cannot get into the hands of children, or because the caps are lost where children find them.

Too often the boy who picks up a blasting cap throws it into a bonfire, strikes it with a hammer or a rock, or uses a pin, a nail or a bit of wire to penetrate the highly sensitive fulminate of mercury — an extremely powerful explosive — with which the copper shell is loaded.

Again, this year, blasting caps will cause needless suffering for hundreds of children. Fingers will be blown off, hands and arms will be made useless, one or both eyes will be destroyed, faces will be disfigured for life, and some of the children will lose their lives.

How many will suffer or be killed depends on the number of blasting caps children find. Do not be among the thoughtless and careless. Do everything you can to keep blasting caps from getting into the hands of your children or the children of others. Blasting cap manufacturers and the Institute of Makers of Explosives are making every possible effort to have users of caps keep them locked in magazines or especially designed detonator boxes; to avoid carrying caps in the pockets of clothing; to make sure that no caps are left lying about mines or other workings, and otherwise to keep caps out of the hands of children.

Satisfied With Value

We wish to inform you that we are well satisfied with your PIT AND QUARRY publication, and think same is very valuable.

E. D. Kilroy, Manager,
Little Falls Sand & Gravel Co.,
Little Falls, N. J.

Geology and Physical Characteristics of the Sioux Quartzite Measures of South Dakota

By WILEY V. LOWE
W. V. Lowe Granite Company, Sioux Falls, S. D.

THE ROCK under the following discussion is named from its prominent occurrence along the Big Sioux river and is the only quartzite of any commercial value in South Dakota. Much of the material is shipped in its various manufactured forms throughout the United States, although restricted greatly by transportation cost.

The outcrop of this rock is spread over a rudely triangular area of a maximum width of about sixty miles, extending across the northwestern corner of Iowa and about equal areas in South Dakota and Minnesota. The formation, although generally concealed by glacial debris and scattered patches of Cretaceous, probably covers a total area of very many square miles. Its lithological characters are almost identical with those of the Baraboo quartzite in Wisconsin.

It is composed of sand grains cemented so well and firmly together by a siliceous cement—created by water washing some deposit to form it and then mixing with the water-laid sand grains—that the rock will fracture as easily through the grains as through the cement.

The rapid running of water over it formed ripple marks which show upon the false beds. It is pre-Cambrian in age and the thickness of the deposit is estimated at from 1,500 ft. to 3,000 ft. in the vicinity of Sioux Falls, S. D., where a bore for an artesian well was made in this rock to the depth of 1,000 ft. and finally abandoned with the loss of a diamond-drill bit in the hole. It would appear that the ultimate thickness of the formation is of necessity little more than a guess.

The quartz grains are fine, rounded, and uniform in size. They have a diversity of unchangeable colors, pink, gray and purple. The formation is irregular with checks, as if metamorphosed into its present homogeneous condition by action of extraordinary heat. This theory is supported by many chimney-like upheavals of broken rock as if blown up by an explosion. The rock stands on edge and in all shapes at the points of the upheavals, and is underlaid with pebbles and rocks of all description, evidently glacial debris.

While the dip of the regular beds is commonly to the southwest, all of them do not dip in that direction, but vary often both in degrees of dip and in direction.

The ice sheet or glacier scattered, in abundance, boulders of various sizes, shapes and formation over the quartzite area so that the quartzite itself now presents many glaciated surfaces and edges that otherwise would be abrupt, are rounded while chatter marks are common. Since the tensile strength of the quartzite exceeds 50,000 lb. per sq. in., it cannot be doubted that this marking was done by an ice sheet of enormous thickness.

This stone is very hard, strong and durable. The quartz is of a close grain, eliciting the most brilliant sparks from steel. In most places where it is exposed to the sun and air, its surface has a high polish entirely beyond any result which could have been produced by diluvial action, being perfectly glazed as if by ignition. In the scale of density in which fluorspar ranks at 4, feldspar at 5, glass at 6, and agate at 7.5, this stone ranks 7.2. The hardness of this quartzite does not refer to the resistance to abrasion that the individual grains possess, but rather to the degree of adhesion between the individual grains.

The physical tests of road-building rock by the U. S. Department of Agriculture report as follows upon the Sioux quartzite:

Crushing strength, 51,700 lb. per sq. in.
Weight per cu. ft., 165 lb.
Absorption, 27 lb. per cu. ft.
Per cent wear, 1.4.
French coefficient of wear, 17.4 to 28 in.
Hardness, 19.3.
Toughness, 17.

The following analyses of two samples indicate the great purity of the Sioux quartzite:

	No. 1	No. 2
SiO_2	98.85%	99.14%
AL_2O_3	.....	0.28
Fe_2O_3	1.02	0.50
CaO	Trace	Trace
MgO	Trace	Trace
Loss at 105 deg. C.	.01	.....
Loss on ignition	.23	.....
	100.10%	99.92%

This quartzite is highly resistant to acids. It fuses only at a temperature of about 3,300 deg. C. and is consequently a refractory of superior quality.

Defects in state of aggregation exist to a more or less extent in some localities where sand pockets are found in the beds of the quartzite, with sandy seams of various width. These indicate that local geologic conditions did not favor the process of cementation. This inferior stone is classed as waste.

The stone breaks evenly, not only with the plane of stratification, but in other directions. Some layers are thin, but more commonly the strata are

A quarry in the Sioux Falls quartzite

thick. The stone is capable of taking a perfect and lasting polish and, therefore, ranks high for ornamental uses. Another quality of importance when considering the stone as a building material is its insensibility to heat.

Quarry Practices

Quarry equipment and necessary tool appliances are much the same as in all hard-stone quarries. The tool steel requires a particular grade as well as great skill in tempering, owing to the extreme hardness of the stone.

In blasting the stone, owing to its friable nature, care is required to avoid shattering that would result in considerable waste, especially when stone is to be quarried for dimension stock. On the other hand, when quarried for crushing, the opposite obtains. In either event, however, skill and efficiency are required. In some quarries, seams are found in the rock of suitable width for advantageous use in blasting, and are therefore of considerable economic value for this purpose.

Commercial Uses

The common consumption of this rock is for buildings, due to its durability and attractiveness; paving blocks, rip-rap and river revetment stone, crushed stone for concrete aggregate, stucco facings, filter beds of sewage-disposal plants, and as a furnace lining in steel mills. It is used also for tube-mill linings, grinding pebbles, digester saucers, linings for acid tanks, and in the manufacture of ferrosilicon. There are many uses for which quartzite may be applicable when fused, as in the manufacture of electroquartz laboratory crucibles and various silica products. This is a matter for exploitation and development.

When quarrying and preparing this rock for building stone, owing to its extraordinary hardness, carving and extensive tool-cutting should be eliminated as much as possible. The deeper and stronger effect is obtained in bold rock-face work, confining the various tinted colors of pink, purple and violet as chosen to uniformity of the different shades. Many handsome structures have been constructed from this stone within its trade territory and in fairly remote points.

The remarkable cleavage of this stone makes it possible to manufacture it into cubed and small-sized modern street-paving blocks at a distinct advantage over granite. When marked with a straight hammer line on its surface, it is turned and, with a blow of a hammer exactly opposite the center of the indented line, it will break surprisingly true and perfectly smooth. A modern paving block, having the smoothness of vitrified brick can be made from this stone.

On account of its density, hardness, wearing qualities, and uniformity in crushing, it is being used more extensively every year for concrete construction work of all kinds. It breaks to irregular angular fragments nearer cubical in crushing than some other products on the market. Like all extremely friable rock, the cementing value is low, however. This is greatly overcome when used wet in mixed sizes of the product, thus filling voids. Good durable service for road and street purposes have been obtained when used as an aggregate with tar or bitumen. Gyratory crushers of strong design, equipped with manganese steel at all wearing points are used universally.

Federal-Aid Bill in Conference

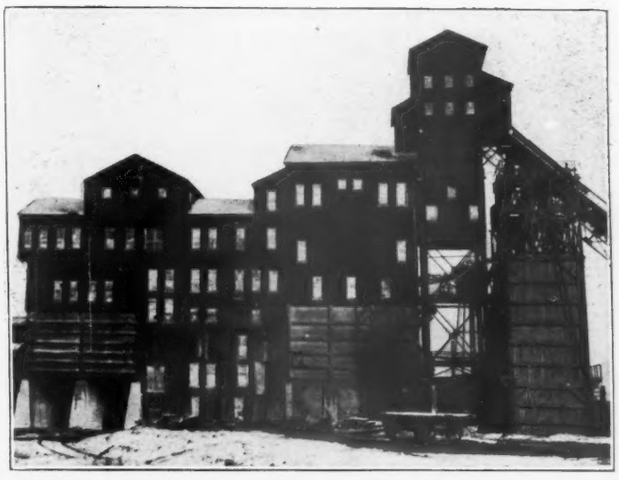
A bill was introduced by Congressman Dowell of Iowa, Chairman of the House Committee on Post-offices and Post Roads, authorizing an appropriation by the government of $125,000,000 for the fiscal year ended June 30, 1932, and the same amount for 1933, to be used in the construction of interstate highways. In addition to the $75,000,000 authorized in the Act of May 26, 1928, for the fiscal year ending June 30, 1931, the previously mentioned bill would provide an additional authorization of $50,000,000, making the authorization for that year $125,000,000 for Federal highway aid.

The bill passed the House on January 21, 1930, and passed the Senate on January 29, 1930. An amendment was added by the Senate which would increase the limit of Federal co-operation from $15,000 to $25,000 per mile with proportionate increases for the public land states. It was necessary, therefore, for the bill to be referred to a conference committee of the House of Representatives and the Senate. It has not been reported out of conference, but the report may be expected within a short time. There is no doubt that the views of the House and Senate can be reconciled and that the government will contribute $125,000,000 each year for the next three years to aid in the construction of highways. The measure commands heavy majorities in both branches of Congress.

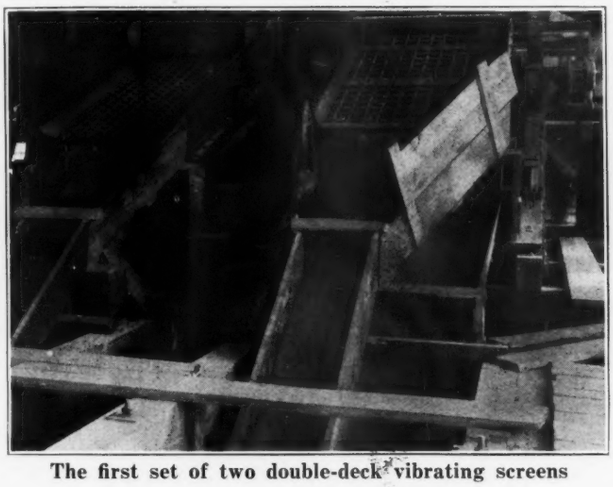
Consumers Co., Installs New Vibrating Screens and Cone Crushers at LaGrange, Ill., Plant

THE Consumers Co. of Chicago, Ill., one of the largest producers and distributors of building material in the Chicago district, has just completed some rather extensive changes in its crushed-stone plant at La Grange, Ill. This, incidentally, is one of the largest plants in the Middle West, having a capacity of over 600 tons per hour. The changes, briefly, consist of the installation of three new Symons cone crushers and seven new Niagara and Robins Gyrex screens.

The stone is given a primary breaking at the quarry level by an Edison roll, which will handle 6-ft. by 6-ft. by 8-ft. stone. This is one of a very few in existence. The roll reduces the stone to 10-in. size and under, and discharges to a balanced-



Main plant building with incline from quarry at right and unloading tunnels at left



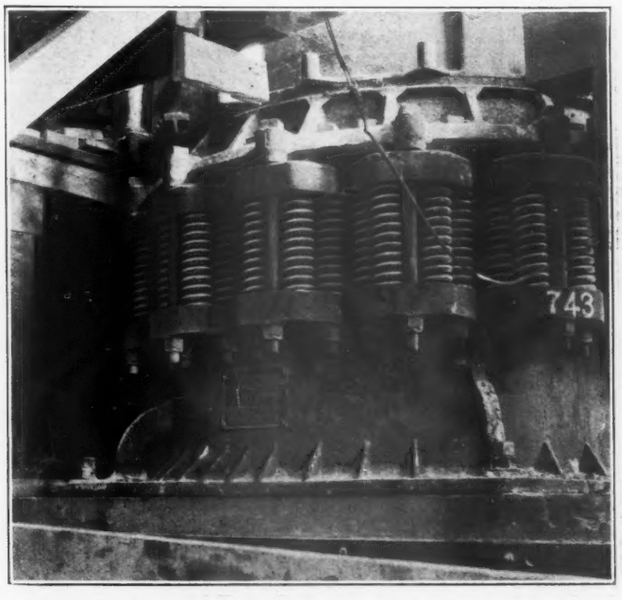
The first set of two double-deck vibrating screens

type skip hoist which uses 12.4-cu.-yd. cars to carry the material to the top of the crushing plant. The skip cars discharge to two revolving scalping screens which are 84 in. in diameter and have 1¾-, 3- and 6-in. perforations.

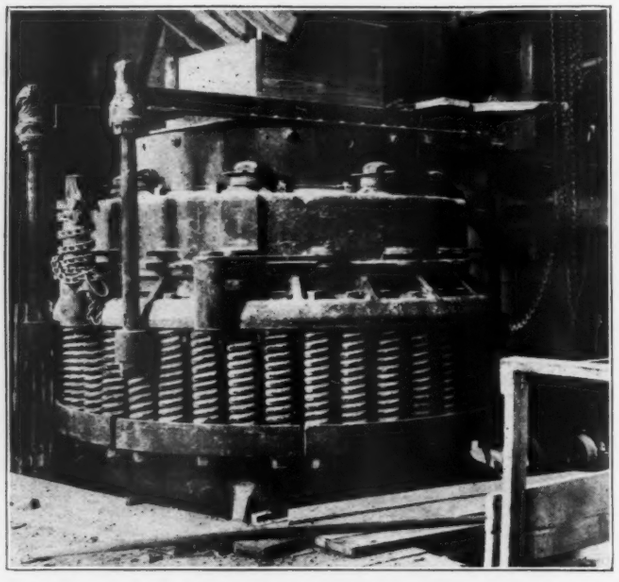
The 3-in. to 6-in. stone goes to bins and is sold for flux. The stone over 6 in. in size goes to a surge bin, which feeds the new 7-ft. Symons cone crusher through a rack-and-pinion gate. The crusher is driven by a direct-connected 250-hp. Allis-Chalmers synchronous motor equipped with push-button control at the crusher. This is the first crusher of this size to be installed in this vicinity.

The discharge from the crusher is split to two bucket elevators. One of these feeds some of the revolving screens which are part of the original plant equipment. The other feeds to the new vibrating screens. The stone under 1¾ in. in size, which comes from the scalping screens, by-passes the 7-ft. crusher to the latter elevator, which discharges through a split chute to two double-deck vibrating screens, one a 5-ft. by 8-ft. Niagara, the other a 4-ft. by 8½-ft. Robins. Both have 4-in. mesh wire cloth on the upper decks and 1⅛-in. on the lower.

The material over 4 in. in size goes through a chute to a 5½-ft. Symons cone crusher and then to a series of revolving screens. The 1⅛-in. to 4-in. stone drops to two Niagara 4-ft. by 8-ft. double-deck vibrating screens. These have 2¼-in. mesh cloth on the upper decks and 1⅝-in. on the lower. Any of the sizes produced by these two screens can be chuted either direct to bins, to the 5½-ft. Symons cone crusher previously described, or to a horizontal belt conveyor feeding a 4-ft.



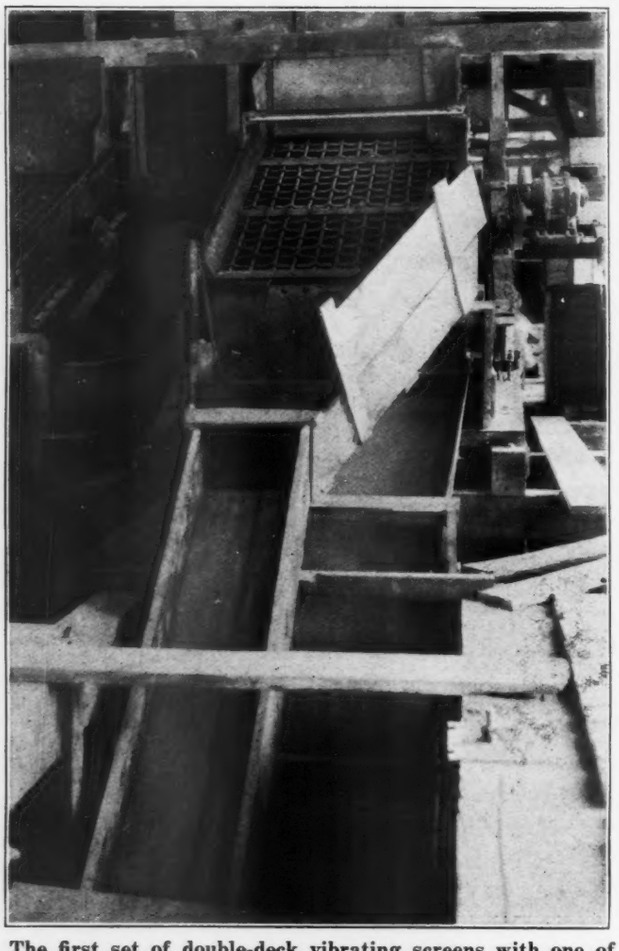
The new 7-cu. ft. secondary cone crusher with direct-connected motor at left



The 5½-ft. cone reduction crusher

Symons cone crusher in an adjoining building. This crusher also feeds to revolving screens.

The stone under 1⅛ in. in size, which comes from the first set of vibrating screens, is chuted to three more double-deck vibrating screens. Two of these are 4-ft. by 8-ft. Niagaras, while the third is a 3-ft. by 6-ft. Robins. These have ½-in. mesh cloth on the top decks and ¼-in. on the bottom. The three sizes produced are chuted directly to bins.



The first set of double-deck vibrating screens with one of second set below

All the vibrating screens are driven through Texrope drives by Allis-Chalmers ball-bearing motors equipped with push-button control. The 5½-ft. Symons crusher is driven by a direct-connected 200-hp. Allis-Chalmers synchronous motor and the 4-ft. Symons crusher by a 100-hp. General Electric motor through a belt drive, for which either a direct- or speed-reducer drive will be substituted later.

The three new Symons crushers replace ten old gyratory crushers and a recrushing roll. This change has resulted in a 50-per-cent increase in crushing capacity and about a 20-per-cent reduction in power costs. A reduction in maintenance and repair expense is also expected. The seven new vibrating screens have replaced two 48-in. by 24-ft. revolving screens and six old vibrating screens. This change is expected to result in a more evenly graded product. It is planned eventually to replace all the remaining eight revolving screens with vibrating screens.

F. W. Greer, manager of pits and quarries for the Consumers Co., was in charge of the alterations, which were made under the supervision of E. B. Dowd, plant superintendent, and representatives of the companies furnishing the new equipment.

New Zealand Speeds Up Hardening Period

In 1894 it took 38 lb. of New Zealand cement twenty-eight days to harden, in 1927, 225 lb. of cement hardened in one day, a satisfactory indication of progress in the cement industry in one of our more often than not forgotten Colonies.

The British Standard Specification is used as the standard of guarantee in this Dominion, although in Australia a local specification which includes the mechanical ramming of test pieces, is in force.

At present only three cement companies are operating in New Zealand, two in the South Island and one in the North. Both wet and dry systems are in use and the latest machinery and methods are adopted. Although the products turned out by the three existing companies are admittedly of very high quality, the doctrine of "Make it Cement" has not been widely absorbed as yet and at present the capacity of all three plants is greater than the demand. — From *"Cement, Lime & Gravel,"* Dec., 1929.

How Many Months Should Make One Year?

By IRVING FISHER
Professor of Economics, Yale University

THERE is a movement in the United States and abroad now definitely under way to simplify the calendar. The calendar has remained virtually unchanged for two thousand years. The League of Nations Committee considering calendar proposals reduced nearly 200 suggestions to two which they declared to be practical. After three years' study and report on the defects of the Gregorian calendar, the League Committee suggested the formation of national committees to study and report on the question. The first was formed in the United States, and has reported in favor of the participation of the United States in an international conference to consider the subject. Similar committees are functioning in Germany, France, Holland, Peru, Hungary and other countries. They are sounding out business, professional, social and religious sentiment with encouraging results.

The American National Industrial Council, for example, reported a strongly favorable sentiment among business men for calendar simplification, according to the Cotsworth plan, which divides the year into 13 equal months of 28 days each. This is one of the two plans approved by the League of Nations Committee. The other would merely equalize the quarters by alternating two months of 30 days with one of 31 days. Both were informatively submitted to public opinion in this country by the American National Committee, of which Mr. George Eastman is chairman. Mr. Eastman personally favors the 13-month plan, although, as chairman of the National Committee, it was his mission to assemble whatever opinions were expressed for and against calendar change without advocating a particular plan. The committee's inquiry showed that American opinion preponderantly favors the 13-month proposal. The advantages of this plan are summarized by Mr. Eastman as follows:

"It equalizes the months, making them exactly comparable for purposes of business, government, and scientific statistics. It does away with the nuisance of split weeks, which occur in every month, and the constant shifting from year to year of the days of the weeks to different dates.

"The variation of the number of work and production days of the different months, which likewise changes every year, is avoided, and the calendar as a whole is reconstructed on a scientific basis. It would be fixed and uniform."

Mr. Eastman reports that, on this basis, about 100 important manufacturing and merchandising concerns in this country now use the 13-period calendar for their interior accountings. Out of 600 replies to a questionnaire sent to 1,000 leaders of American industries explaining the proposals for calendar change and the principle of the division into 13 months, 93 per cent approved the plan. The British railways have organized their accounting systems on this basis. Many English warehouses are also operating on 13 periods per year. A majority of the special calendar committee of the Chamber of Commerce of the United States which recently reported, favored this proposal; although it decided not to recommend a particular plan. The Chamber is now conducting a referendum on calendar change among its members throughout the country. Nine out of every ten replies to a questionnaire sent its members by the American Management Association favored the adoption of the Cotsworth international fixed calendar. Many labor unions approve it; among them the International Association of Machinists, the Brotherhood of Railway Clerks, and the Trades and Labor Council of Canada. The National Association of Cost Accountants favor it.

Probably there is no person in the non-metallic mineral industries who has not heard or read propaganda for changing the world's calendar, this matter having been discussed for a number of years. As with the matter of a change from our customary systems of weights and measures to the metric system (discussed on page 87 of November 20, 1929 PIT AND QUARRY), there are two sides to be considered.

Upon first reading the advantages that would follow the universal adoption of the metric system, we naturally become proponents for it. This applies especially to technical men who have been trained in the laboratory usage of the metric units of weights and volumes. But American manufacturers have advanced strong arguments against the adoption of the system. Likewise is the proposal of a change from our ordinary or Gregorian calendar, although it does not appear that the defense in this case can present as strong arguments as can the plaintiff.

Prof. Irving Fisher of the chair of economics in Yale University, New Haven, Conn., is a strong advocate of changing our calendar. He has published a pamphlet entitled "What is Calendar Reform?" We learn therefrom that this matter has elicited the serious interest of many nations and of leading industrialists in our own country. He points out that there are business, religious and sentimental objections to the proposed calendar and he discusses the difficulties that would be involved for a time if a change were made.

Probably our readers include men who will line themselves upon opposite sides of the argument. It is interesting at any rate, to have this matter presented by such an eminent economist. How much benefit could American operators expect under the proposed change? Or would such a calendar actually prove inferior to our present one despite its acknowledged shortcomings?—Editor.

A. Cressy Morrison, representing the International Fixed Calendar League, has presented its case to the Commerce Committee of the American Bar Association, which has undertaken a study of the subject. Representatives of the Calendar League have advocated the stabilization of the month to 28 days, with holidays falling on Mondays, to men's and women's clubs and business organizations throughout the country.

As a result of this work of organizing public sentiment, Representative Stephen G. Porter, chairman of the Foreign Affairs Committee of the House, has introduced a resolution "requesting President Hoover to propose an international conference, or to accept an invitation in behalf of the United States to participate in such a conference for calendar simplification, should it be proposed by some other nation or group of nations."

The most convenient year for putting the new calendar into effect would be 1933, when January 1 falls on Sunday, so that the first day of the week will also be the first day of the month and of the year. The interval between 1929 and 1933, in Congressman Porter's opinion, is needed for active preparations to make the change.

Standardization of our unit of time, the month, is of only less importance than standardization of the unit of money, the dollar. All other units employed in business, such as the pound, the year, the bushel, the gallon, the acre, the kilowatt, are already standardized or stabilized. A business year of 13 equal months of 4 weeks or 28 days each, with an intercalary day at the end of the year, would stabilize our time measurements.

Advantages of the Proposal

What are the advantages of this plan as sponsored by the heads of great business organizations which have reported to the National Committee their preference for the 13-months' system over any other? What are its disadvantages?

A year of 13 equal periods, as proposed by the International Fixed Calendar League, would meet the requirements for precision of modern business. It would regularize at once the confusions of the Julian and Gregorian calendars of months of 28, 29, 30 or 31 days, with their varying number of Sundays, Saturdays and holidays. These are the bugbear of corporate and governmental statistical departments. For their calculations must be constantly adjusted to allow for the calendar irregularities. These make it impossible to compare with accuracy corresponding periods in successive months and years for the payment of salaries, annuities, interest, insurance, pensions, leases and rents, as fixed on the calendar divisions.

The fundamental defect is that the months are not exact multiples of the weeks. They begin on different days of the week. They make a jumble between the different days of the week and the corresponding days of the month. The National Industrial Conference Board has prepared diagrams of the calendar irregularities with reference to length of months, and with reference to the beginning and ending days of the months during 1929; these show graphically the disturbing effects of the unco-ordinated weeks and months. I have constructed another diagram which shows the extreme lack of uniformity in the number of working days in different months during three years. The percentage increase in the number of working days between February and March is especially acute, and explains how monthly business comparisons are invalidated.

Thus a business organization is confronted with a dilemma, whether it fixes its monthly meetings on, say, the third Thursday of the month, or on a specific date, such as the tenth or the fifteenth. The third Thursday falls anywhere from the fifteenth to the twenty-first, so that accounts prepared for the meeting, as of the preceding month, which might be prepared in 14 days, may not be considered, possibly, until 20 days have elapsed. On the other hand, directors who organize their routine according to the days of the week find that the tenth or the fifteenth, the meeting day, disturbs this routine by falling upon different days of the week in different months.

Because there is no fixed relation between the weeks and the months, weekly wages must be paid, sometimes four times a month, sometimes five times. Then the computations of monthly costs become confused; statisticians must make elaborate adjustments in order to correct their comparisons. Accountings of monthly receipts are disturbed, as in the case of concerns whose Saturday's business is heavier than that of other week-days; or, in the case of summer resorts, where the business of the four or five Sundays in the month must be accounted.

Under the proposed calendar, annual dates would be regularized, since the same days of the month, in different years, would fall on the same days of the week. When a date is fixed by the day of the month, such as the Fourth of July, the day of the week on which it falls would not vary, and conversely when a date is fixed by the day of the week, such as Thanksgiving Day, it will come on the same day of the month. We shall no longer have the inconvenience of figuring out election day as the Tuesday after the first Monday in November, nor Easter day, the fixing of which is more complicated.

A New Month, "Sol"

It is proposed to intercalate an extra month between June and July. All months would have 28

days, with the exception of December, which would have 29. December 29, by international agreement, might become a World Peace Holiday, or "Year Day."

Calendars, as we know them, might be dispensed with, since in every month everybody would understand in advance that the four Mondays, for example, fall on the second, ninth, sixteenth and twenty-third, respectively.

Moses B. Cotsworth, who spent his personal fortune in urging calendar reform, until it has now aroused the attention of the business world, has impressed upon business leaders that they need an unvarying yardstick of time, by pointing out the consequences of deflections in statistics caused by the present irregular calendar month.

Mr. Cotsworth's analysis of the monthly Index of Manufacturing Production issued by the United States Government is in point. This index is a standard authority. It is constantly thrown out of balance by the calendar. Mr. Cotsworth has shown how its index number was 113 per cent for November, 1923, and only 110 per cent for November, 1924, showing, apparently, a reduction of three points (1919 was the base year, with an average of 100 per month). But instead of the supposed reduction of three points there was really an increase of four points. That was because American producers work eight hours a day from Monday to Friday and only four hours on Saturday, and this 44-hour week yielded 192 hours for production in November, 1923, as against 180 hours in November, 1924. But November, 1923, had five Thursdays and Fridays, yielding 16 hours for work, against the five Saturdays and Sundays of November, 1924, which allowed but four working hours beyond the four full weeks of 44 hours each; these regularly amount to 176 hours as the basis for testing comparisons of production. Mr. Cotsworth adds:

> As 180 hours in 1924 were to 192 hours in 1925; so should the 110 points indicated by the unadjusted tabulated totals for 1924 be to (192 x 110) divided by 180, yielding 117 points as the true comparative index; according to the working hours available in factories working regular weekly hours.
>
> That is evident where regular units of production per hour were collectively maintained. But in those cases, as also for individual factories working overtime, or short time, worldwide extra work at statistical adjustments are imposed by the present calendar, upon those who strive to find the true monthly trend of business.
>
> Such difficulties and extra work would be abolished by the regular use of 4-weeks-months.

Again, Mr. Cotsworth takes the case of a factory regularly producing the same quantity of goods per working hour from August 1 to December 31, 1924. The monthly comparative production works out for August, 100; September, 102; October, 106; November, 96; and December, 106. Thus is recorded a misleading decrease of 10 per cent in November, and four different ratios of deflections, caused wholly by the two and three days in excess of four weeks in each month and the varying business values of each day, in weeks, from August 1 to December 31.

Mr. Cotsworth notes that manufacturers paying weekly wages on Saturdays had five weekly paydays in each of the two least productive months of August (the basic month, equalling 100), and November (96), while they had to give monthly credits for the goods they sold.

Mr. Cotsworth goes on to show that the present irregular calendar would fail, as would any substitute calendar of twelve months, to establish the uniform benefits of the 13-month proposal. He calculates that even though the months were equalized as nearly as possible as between 30-day and 31-day months, workmen would suffer a decrease of 2 per cent in earnings in the 31-day months, as against 10 per cent increase in expenditures, making a total disparity of 12 per cent. This would be because these months would include five Saturdays and Sundays, with only half an earning day for the two extra days; on these two days their expenditures would average double the amount expended on any other two days of the week, because of week-end payments for family expenses, recreation, church, club, and other weekly contributions and charges.

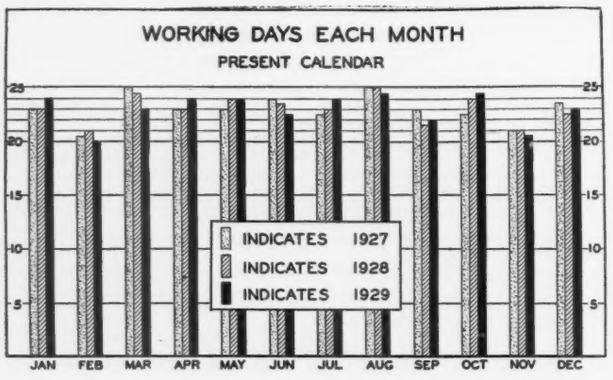
The 28-day month would largely do away with these inequalities of income and outgo, both for individuals and for corporations. Months of equal length and the same totals of week-day values would measure accurately the fluctuations in government, export, import, business, scientific, health, city and home affairs. There would be no need of adjustments or explanations.

Waste of Time

Other advantages, statistical and financial, have been carefully estimated. What does it cost in time and money in wasteful searching through calendars and referring to them, in order to fix suitable days and dates for work, pay, correspondence, the advance arrangement of meetings, and in drafting, advertising, printing, and fixing costs at law. The waste involved in calendar irregularities has been reckoned at $30,000,000 annually in the United States at the rates for employment of clerks.

Mr. Cotsworth has observed that, by using thirteen months of twenty-eight days, the rate of turnover of money is quickened; money for labor, salaries, rents, pensions, and to pay for manufactures, wholesale and retail trade, railway and shipping charges, and so on, would circulate thirteen times a year instead of twelve times.

Mr. Eastman points out that in addition to re-



leasing funds in national circulation, business generally will be benefited through the release of the fifth weekly pay-roll in the longer months of the present calendar, together with the release of one-thirteenth of the difference between the total monthly debit and credit accounts. Bad debts and outstanding accounts, Mr. Eastman calculates, would be automatically reduced by nearly 10 per cent. Individual accounts will benefit just like the Treasury Department, and in proportionate degree, when it should find itself in the position of releasing a large sum from the permanent monthly circulation.

Frederick W. Keough has pointed out that not only the work of scientists and statisticians and the operations of business men would be facilitated by this proposed change in the calendar, it would have numberless conveniences in the conduct of household affairs. The housewife could budget accurately the expenses of the home. Dates for payment of rents, personal notes, instalments, interest, and fixed charges of all kinds would have identical intervals. Household expenditures for heating, lighting, and other services would be made consistent with both the weekly and monthly income. The monthly income would not have to be stretched to a varying total of expenses based on weeks and parts of weeks in each month. The week-days per month would be uniform in number, as every month would have four weeks. The Sundays and holidays would no longer shift, further to complicate the situation.

The new calendar would make it convenient to shift all national and State holidays to Mondays, so that wage-earners and their families could prolong the regular week-end holiday until the following Tuesday. Authorities of schools and colleges could standardize their school year and the periodic vacations.

Finally, the flow of business operations which culminate with the change in styles and popular spending at Eastertide and Whitsuntide would be stabilized. The differences now imposed during preparation of production and sales programs in successive years, caused by an Easter that wanders over 35 days from year to year, would be ironed out.

The new calendar, beginning auspiciously in 1933, can be ushered in with the legal provision that dates on existing bonds, mortgages, leases, contracts, and so on, be automatically changed to the corresponding dates on the new calendar by means of the adjustment table just as was done in England in 1752, when the Gregorian calendar was substituted for the Julian. It would provide for the prorating of fixed charges; for example, monthly rent payments would be divided into 13 instead of 12 equal parts. Thus there would be no need of changing the wording of legal papers covering periods of time during the transition to the new calendar regime.

There would be a conversion of dates marking the end of contractual periods from the old calendar to the new, as well as of specific dates that result from the anticipated establishment of definite periods under the present calendar.

Objections to the Proposal

There are two business objections. First, to prepare 13 monthly business statements requires more labor than to prepare 12. This objection, if it be an objection rather than an advantage, is trivial. Second, quarterly and half-yearly statements cannot be derived, without adjustment, from monthly statements. A 12-month period is divisible by 6, 4, 3 and 2. But as we almost never make any practical use of the divisibility by 6 or 3, these may be disregarded. As to divisibility by 2, it is evident that semi-annual payments would come on the first Monday of January and the middle Monday of "Sol" or whatever the midsummer month would be called, while a quarter of a year would simply be three months plus a week. These would be far less troublesome than the present failure of months and weeks to synchronize. It will be easy for all who continue to use quarterly periods to balance their books at the end of the thirteenth, twenty-sixth, thirty-ninth and fifty-second week.

Besides the business objections, there are religious and sentimental objections. For example, the new calendar would contain thirteen "Fridays the thirteenth."

Also, there would have to be reconciliation of one's birthday to the new calendar, until the present generation is succeeded by a generation born under the new calendar dates. Washington was born on February 11. When he was 21 years old the calendar was changed so that his birthday became February 22. Christmas would no longer fall on the accustomed date; Independence Day would have to be adjusted from the Fourth of July, and so on. But we are already accustomed

(*Continued on page* 47)

Fort Worth Sand and Gravel Company Operates New Plant Embodying Unique Features

Pit-Run Material Is Washed, Screened, Stored, Then Mixed to Desired Specifications

By A. J. HOSKIN

The December 18, 1929 *issue of* PIT AND QUARRY *contained a brief description of the new plant of this company with the assurance of a complete article to follow in a later issue. The following article has been prepared chiefly from information furnished by Mr. Quigley who, as is stated, assumes personal responsibility for the general layout of this interesting plant. Our opinion is that he should credit himself with an accomplishment rather than with an accountable obligation.*

THE new plant of the Fort Worth Sand and Gravel Company, Inc., is 8½ mi. east of the city of Fort Worth, Texas, in the valley of Trinity river, near a station on Rock Island railroad known as Hart Spur. The significance of this name inheres in the facts that J. O. Hart is vice-president of the company and that a spur track owned by this company connects the main railroad with the plant.

Responsibility for originating the general plan of the plant and for the selection of equipment is assumed by R. M. Quigley, treasurer of the company. He states, however, that to William W. Hyde belongs the credit for working out all of the details and of personally supervising the construction of every part, including the placing of all equipment. Mr. Hyde is an engineer of wide experience in constructing gravel and rock-crushing

One screening unit before addition of baffle device

Conveyor from track hopper to washing plant, and conveyor thence to the six sets of vibrating screens which prepare grades for the several stock piles beneath

Showing crater effect in piles due to withdrawals into tunnel

plants, and this plant is only one of a number of successful plants he has built in Texas. He is a native Texan, a Yale graduate, and for a number of years held the position of construction engineer for the New York, New Haven and Hartford railway. He holds the position of construction engineer for this company, but his services as consulting engineer in matters of plant construction are available to others.

The president of the company is H. P. Bonner, and the secretary is T. E. Popplewell. Mr. Quigley has been engaged actively in the gravel business for the past fifteen years and has given close study to plant layouts and details. This new plant is, therefore, the product of long planning which utilized experience acquired in the erection and operation of several earlier plants, and involved visits of inspection to many important gravel plants throughout the United States. In this work he was ably assisted by Mr. Bonner, whose particular study was concerned with the commercial distribution and requirements to meet engineering specifications. Mr. Hart, although officially the vice-president, is also the superintendent. He operated two other plants prior to the erection of this one.

All building materials and much of the equipment for this plant were purchased in Fort Worth, either from local manufacturers or from the agents of distant manufacturers. All steel work was supplied by the Fort Worth Structural Steel Co.; all lumber by William Cameron & Co., Inc.; cement by the Trinity Portland Cement Co.; conveyors, screens, feeders, and bin gates by J. W. Bartholow Co.; conveyor belting by the National Supply Co.; pumps and connections by the Axtel Co.; motors by the Central Electric Co.; and all electrical installation by Hambrick Electric Co.

Aerial view of plant and vicinity

In designing the plant, the officials followed usual lines, but special features were incorporated so that, as a whole, it is unique in its field. Like all other producers they had problems of plant operation which do not arise in all other locations. One of these important problems was to provide storage for those sizes of material for which there is not an immediate market. At the plants with which these men were familiar, such surplus material was loaded first into cars and then unloaded to storage piles alongside convenient trackage,

Fort Worth Sand and Gravel plant. Pit material enters by elevator

there to remain until a market demand required its rehandling into cars for shipment, all of which added much to production cost.

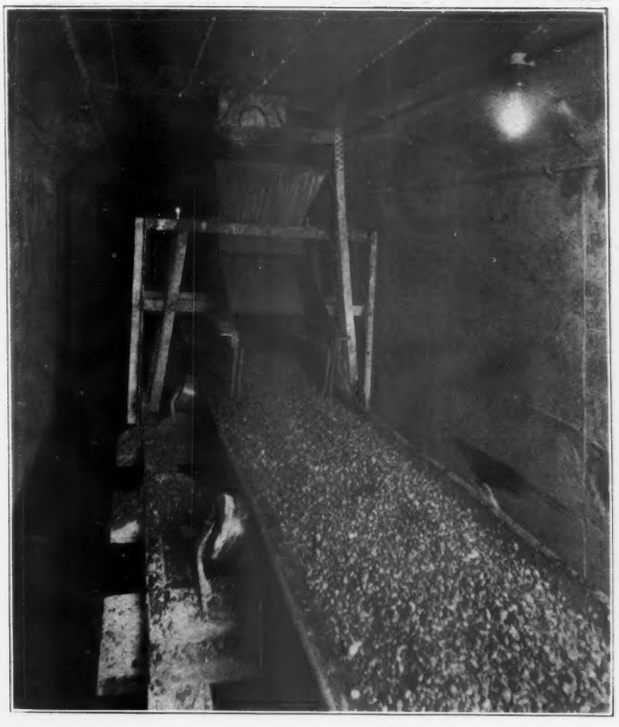
Another problem was to provide means for grading materials to meet the constantly changing demands of the various purchasers. To accomplish this it was necessary to provide a system by which each car may be loaded with a different grading without increasing the cost of production. These problems are believed to be solved by the present layout.

The pit is an old one, at present covering possibly 3,000 acres. The overburden varies between 3 ft. and 9 ft., while the material has a depth of from 12 ft. to 18 ft. The crude pit-run averages about 45 per cent sand and 55 per cent gravel. The deposit lies below water level, so there is no problem of water supply. The pit-run material is fairly clean. It is excavated by a Monighan model 3W walking dragline and a Bucyrus class 24 dragline, each with a large bucket, and is loaded into stand-

Aerial view of gravel pit

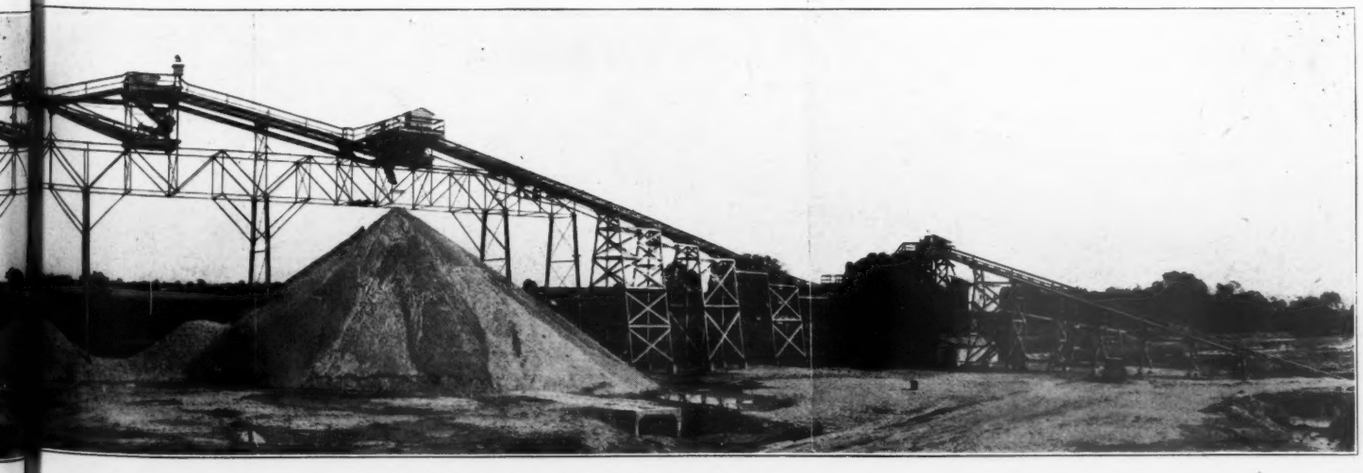
ard-gauge National bottom-dump cars, each of 50-ton capacity, for transport to the track hopper at the plant. There is very little gravel exceeding 2½-in., the largest size prepared in the plant. Hence there are no crushing facilities in the flowsheet of this plant. The small amount of oversize gravel is sold to paving contractors for special jobs.

The track hopper is 36 ft. long and 22 ft. deep.



Tunnel conveyor, traveling hopper, and bin-gate loading from a stock pile

Mr. Quigley now believes that the hopper should have been built 40 ft. long to properly handle the discharge from the 50-ton cars. From the hopper the material is fed through an ordinary plate feeder with a special manganese bottom to a 30-in. Telsmith belt conveyor which carries it to the top of the washing plant—a distance of 215 ft. from the railroad track—where it is sluiced or washed into a 60-in. Telsmith revolving scrubber screen, using 1,400 gal. of water per minute. This screen has a scrubber section 8 ft. long, followed by 12 ft. of screening section with ⅜-in. perforations, surrounded by an outer jacket of ⅛-in. wire screen cloth. The sand passing the ⅛-in. screen passes with the water into sand boxes. Two ordinary sand-drags are used to further wash and dewater



at extreme right and products are loaded into cars at extreme left

Close-up of 1½-in. screen showing discharge to storing baffle

the sand. The percentage of the fines is regulated by the height of the spillway. Wash-water is furnished by a 6-in. single-stage Goulds centrifugal pump, at the rate of 1,300 gal. per min.

The dewatered sand is next sent to the top of the screening and storage section of the plant on a 24-in. Telsmith belt conveyor which runs beside another conveyor of the same width and make that carries the gravel and the sand that is coarser than ⅛-in. However, before the gravel reaches its conveyor it is given a brief treatment by a special device, contrived by Mr. Hyde, the purpose of which is to still further remove any excess water which clings to the pebbles as they leave the end of the revolving screen.

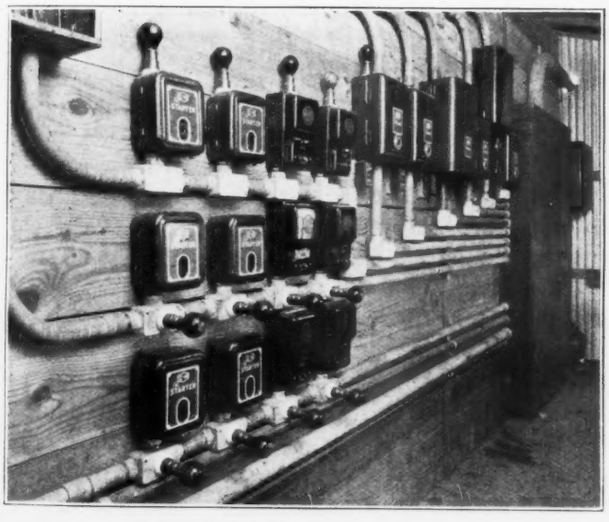
This ingenius but simple device is a short, slowly revolving, perforated cylinder set at right angles to the revolving screen. As the pebbles are discharged upon the outer surface of this cylinder, the adhering free water drains for a moment while the cylinder turns sufficiently to permit the pebbles to slide off onto the belt conveyor already mentioned.

The fine sand is dropped from its conveyor onto the first or largest storage pile. All of the plus ⅛-in. material, on the other belt conveyor, is carried beyond this point and is transferred to another 24-in. Telsmith belt conveyor which carries it to the hopper of the first or 2½-in. Leahy vibrating screen, from which the oversize falls onto the second storage pile beneath. The material that passes through this screen falls onto another Telsmith conveyor belt which carries it to the next or 1½-in. Leahy vibrating screen, from which the oversize falls to the third storage pile. In similar stages, successive Leahy vibrating screens prepare oversizes of ¾-in., ½-in., and ¼-in. The throughs of the final screen are the ⅛-in. to ¼-in. material which drops to the last pile, from which it is removed later and mixed with the fine or minus ⅛-in. sand to produce desired grades to be mentioned later.

Plant as viewed from receiving end near track hopper

An innovation at this plant is a device which handles the product from each of the sizing screens and conducts it without segregation to its respective storage pile. These devices were added after the plant had been in operation for some time and they have demonstrated their efficiency. Each one comprises a light structural-steel vertical framework, extending from the ground surface to the discharge end of its respective screen, with shelves of steel plate at 3-ft. intervals. Material accumulated upon each shelf until its natural slope created a baffle and the material merely cascades back and forth with constant mixing until it reaches the top of the pile, which builds up about the framework. The devices—which have not been given a technical name—are 24 in. square for the 2½-inch gravel and 36 in. square for each of the remaining products.

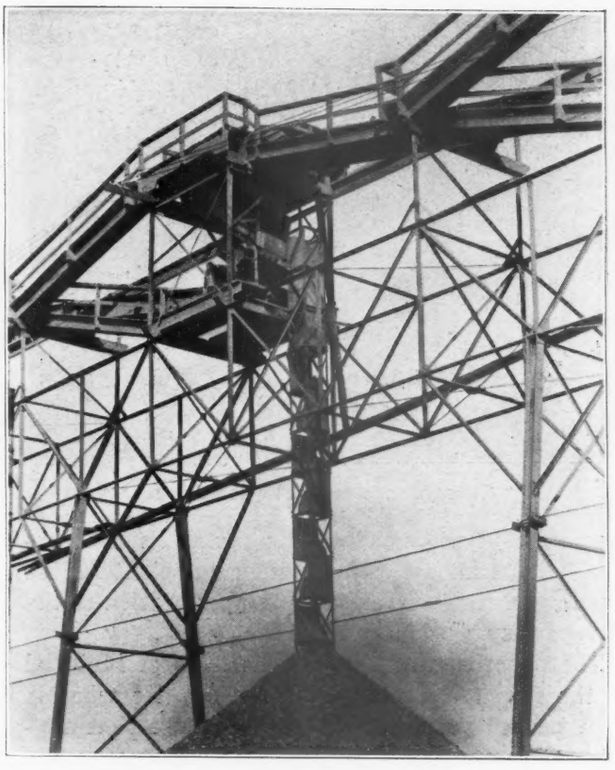
These six Leahy No-Blind vibrating screens, manufactured by the Deister Concentrator Company, are uniform in size, 4 ft. by 7 ft., of the single-surface open type, and each is driven by its individual electric motor. A perforated stationary plate set at an angle of 45 deg. receives the material directly from the conveyor, just ahead of the respective vibrating screen. This plate receives the impact of the material as it is discharged from the conveyor and utilizes gravity screening ahead



All motors in receiving, washing and screening sections of the plant are remotely controlled in this room

of the vibrating screen. The throughs from both types of screen unite in their discharge.

Mr. Quigley states that one question which gave him much concern during the design of this plant was the probable effect from vibration in the use of vibrating screens placed on a steel structure at a height of nearly 60 ft. above the ground. In the present case, this point is of especial interest inasmuch as the manufacturer of the Leahy screen contends that only the screen cloth vibrates and hence no appreciable vibration could be transferred to the structure proper. To be doubly assured,



Showing details of a baffle device for prevention of segregation in stock piling

however, Mr. Quigley devised a special method of mounting the screens, to be installed should they ever be found necessary, which, thus far, seems improbable. The frame of each machine is suspended from above by means of rods so that the weight of the screen is actually supported by these means. Turn buckles regulate the inclination of the screen surface. In actual service these screens appear to justify the claims of the Deister Concentrator Company that they vibrate wholly within themselves. No vibration is noticeable in the plant's structure and the screens have proved entirely satisfactory, with capacities much in excess of their claimed ratings, according to Mr. Quigley,

Rinsing screen in loading plant

Conveyor motors and gear drive

Conveyor near discharge end of the tunnel

who adds, "I will say that one cannot be too careful. I have known of more than one plant failure due to vibrating screens imparting vibration to the structure upon which it rested."

The deposition of the various sizes of material in the respective storage piles completes what is here termed production. The structure that supports the screens and intermediate conveyor is 750 ft. long and is parallel to the railroad track at a distance of 215 ft. All of the conveyor belting is the Dellie brand, made by the Manhattan Rubber Manufacturing Company.

Loading Out

Below the surface of the ground underneath these seven storage piles is a long main material handling tunnel. At right angles to this main tunnel there is a lateral tunnel, extending both ways, beneath the middle of each pile. Each tunnel is 7 ft. by 7 ft. inside measurements, and of reinforced concrete construction.

Bin gates furnished by the Weller Manufacturing Co. are spaced at 10-ft. intervals along the roofs of all of these tunnels. A main belt conveyor traverses the length of the main tunnel, while shorter belt conveyors traverse each branch tunnel. These short conveyors deposit their loads upon the main conveyor. All of these are Telsmith conveyors. When it is determined what percentage of each size of gravel is required to produce a desired grade of product, traveling hoppers operating on tracks and straddling the conveyors are placed beneath the various bin gates through which material is to be drawn. These hoppers are so adjusted that each will allow any desired flow of its respective stored material. By then opening the gates above these hoppers any desired grade of aggregate can be fed to the main conveyor. Variations in grade may be regulated at any time.

Motor and gear drive for long conveyor

After passing from the extreme end of the main tunnel, the belt conveyor slopes upward for a distance to its end where it deposits its burden upon a Telsmith cross conveyor which rises in its travel of about 215 ft. back to the railroad track, where is located what is known as the loading-out section. Here the material is washed a second time to a perfection of cleanness. If gravel is being loaded out for shipment it is passed through a Telsmith revolving dewatering screen, 48 in. in diameter and with 1/8-in. mesh, together with 400 gal. of water per min. furnished by a 4-in. Goulds centrifugal against a total head of about 100 ft. The gravel then passes into the railroad gondola through a swinging chute which operates from side to side to prevent segregation and coming. When sand coarser than 1/8-in. is being handled, no rewashing is done.

All equipment through the plant has roller bearings. Electric power is used throughout, there being altogether 24 motors aggregating a capacity of 269 hp. In every case there is an excess of motor capacity to provide for future increase in plant output. Provisions have been made to double the number of screens in the future.

All motors in the first two general sections of this plant are controlled from a central point, the

(*Continued on page* 52)

New Orleans Plant of International Cement Corp. Remains One of Leading Plants in South

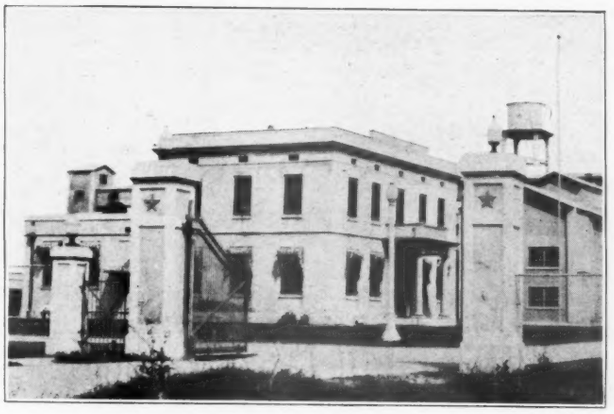
Compactness of Design Attained Without Sacrifice of Appearance or Space for Future Enlargement

THE plant of the Lone Star Cement Company of Louisiana at New Orleans, La., although now almost three years old, remains one of the best plants in the entire South. In common with others of the newer plants of the International Cement Corporation, it embodies many modern features of design and operation which have been proven in actual operation. It is a two-kiln wet-process plant with a capacity of 1,000,000 bbl. of cement per year.

Very few changes have been made in the plant since it first went into operation and these have been due to local conditions. Limestone and clay were originally used for raw materials. This clay, which contained the necessary silica, oxide of aluminum and oxide of iron, was obtained from the settling basins of the city water purification plant where the muddy water of the Mississippi River is made fit for human consumption. The clay has been replaced by shale, obtained from a pit near the limestone quarry, and silica sand. The equipment installed for handling and processing the clay is no longer being used. This change was made so that a higher grade of cement could be produced.

The kiln was originally fired with powdered coal and a complete and modern system for handling and grinding coal was used. During the past year, however, a fuel oil system was installed. This is completely described in the following text.

The plant is located about four miles northeast of the main business section of New Orleans inside of the city limits. It is on the west side of the Industrial Canal connecting up Lake Pontchartrain and the Mississippi River at a turning basin where the canal is wide enough to allow ships to turn about. The location permits all raw material and supplies to be shipped in by water and the product shipped out in the same manner. The Industrial Canal gives easy access to all Mississippi River and Gulf points as well as those on the many navigable rivers running into these. The local market alone demands a large part of the output of the plant as the three nearest competing plants are located 250 miles northeast, 350 miles northwest, and 300 miles west of New Orleans. Unlike most of the city of New Orleans the plant site is above the level of the river which is a great advantage in itself. The swampy nature of the ground, however, necessitated great care and additional expense in the de-



The ornamental entrance to the plant grounds with office building in foreground

The Lone Star, New Orleans, plant from the Industrial Canal. Unloading dock and raw material storage in foreground

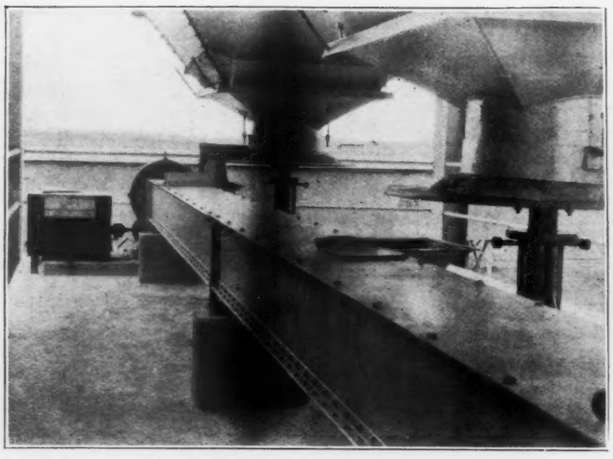
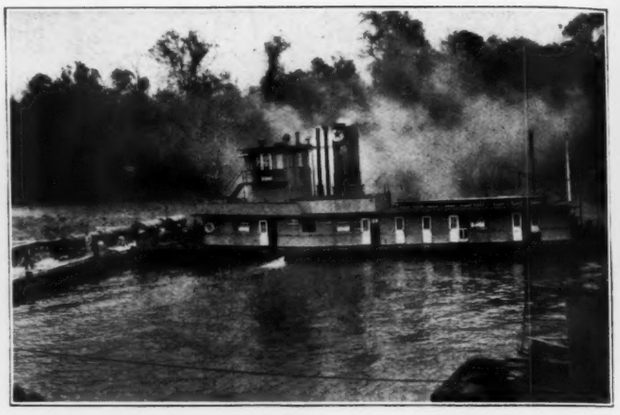


Plate sand feeders and enclosed screw conveyor. Speed reducer drive in background

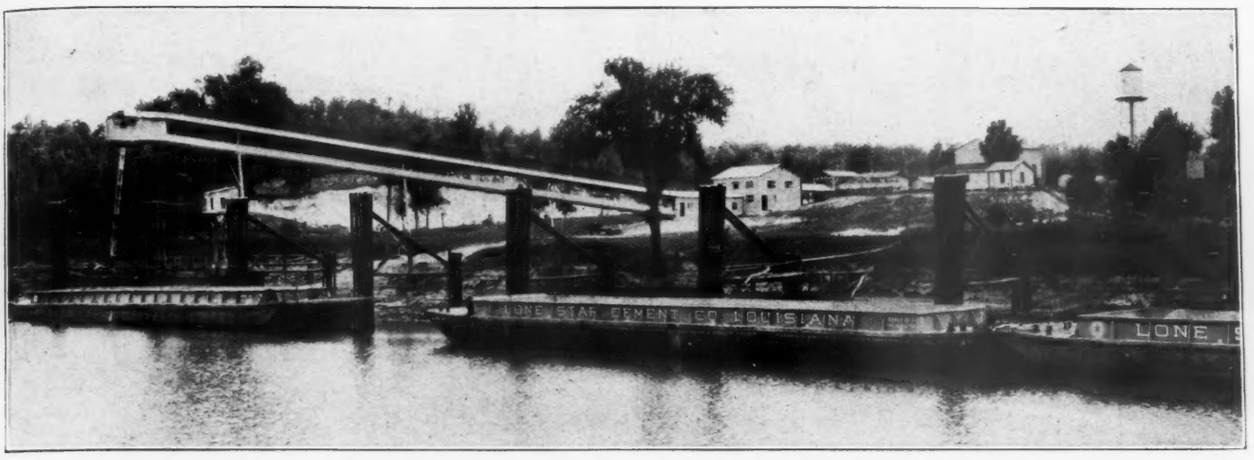


The Incor pushing barges of raw material down the Tombigbee River from quarry

sign and construction of the foundations which support the heavy machinery.

The appearance of the plant as a whole is pleasing and as beautiful architecturally as it is possible for a cement plant to be. The buildings are all of concrete or stucco in their natural colors. The grounds are very well kept and the plant is spotless inside and out as is customary with all International plants. To one who is accustomed to seeing cement plants located in dirty, ugly manufacturing districts in large cities or in the open country with no habitations for miles, this plant is a pleasant surprise. The district surrounding the plant is rapidly growing into one of the better residence sections of New Orleans with many substantial new homes being built all of the time. Many of these are owned by employees of the company. This condition may be largely attributed to the efficient system of dust prevention and collection in the plant. The thick layer of dust which often covers the ground for miles around a cement plant, and renders the vicinity of such a plant unfit for human habitation, is conspicuous by its absence. All possible moving machinery is enclosed in the

Electric shovel loading cars in lime rock quarry at St. Stephens, Ala.



Barges of raw material being loaded at St. Stephens quarry. Crushing plant and loading conveyor in background, quarry at left

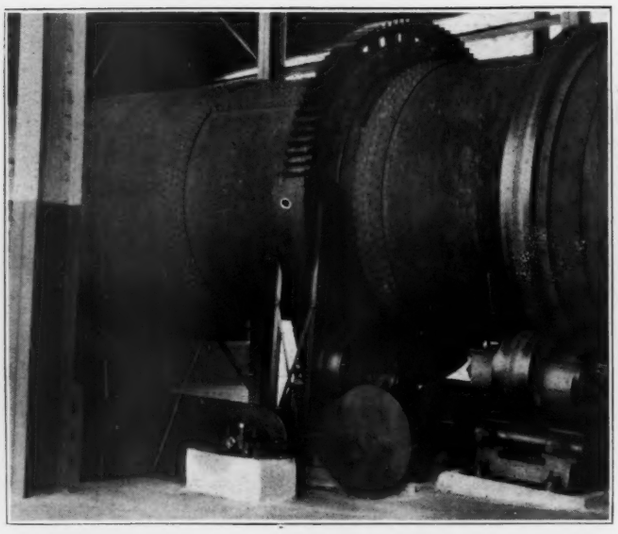
interests of safety. This, together with the dust-collecting system, makes the plant almost dustless.

Raw Material Quarrying and Shipping

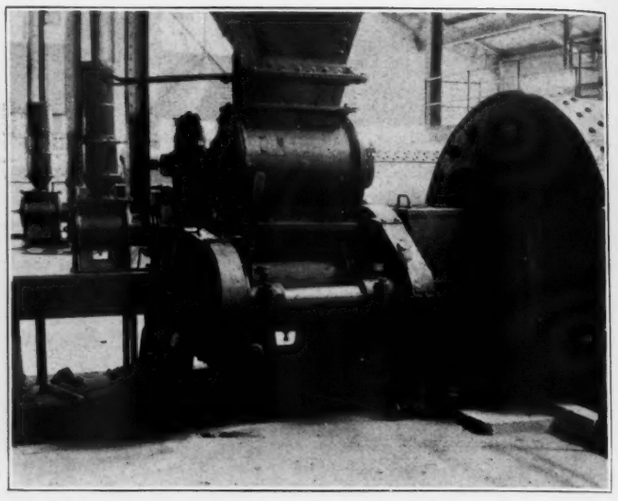
The quarry is located at St. Stephens, Ala., on the Tombigbee River about 75 miles north of Mobile and 275 miles by water from New Orleans. The rock is the Marianna limestone which is found all along the north Gulf Coast. This rock is of high quality and is so soft that it is dug by the shovel without first requiring drilling or blasting. The stone is excavated by two 1½-cu. yd. electric crawler shovels which load into 6-cu. yd. dump cars on narrow-gauge track. These are hauled by 12-ton gasoline locomotives to the crushing plant. A hammer-mill reduces the stone to the size required and discharges onto a long enclosed inclined belt conveyor which discharges through a spout to barges at the dock. The shale which lies under the limestone strata is excavated and handled by the same methods. The plant and conveyor trestle are of structural steel and the buildings are sheathed with corrugated metal siding and roofing. The spout to the barges is in sections and can be adjusted to the varying level of the river.

The 1,200-ton-capacity steel barges, 180 ft. long by 40 ft. wide, are towed three at a time 150 miles down the river from St. Stephens to Dauphine Island at the mouth of Mobile Bay. They are towed by the twin-screw 750-hp. Diesel-driven towboat "Incor" which has tunnels protecting the screws from logs and shallow water. At Dauphine Island the barges are taken over by the deep-water type 500-hp. Diesel-driven tug "Lone Star" and hauled 125 miles through Mississippi Sound, Lake Borgne, Lake Pontchartrain and the Industrial Canal to the plant. A round trip is made every three days. An accurate check is kept on the movements of these boats by a special system of communication between St. Stephens, Mobile, and various lighthouses along the Gulf Coast.

Overhead crane handling raw material in storage. Industrial canal in background



Drive of one cooler, with enclosed motor at left



Feed end of finish grinding mill, with raw mills in background

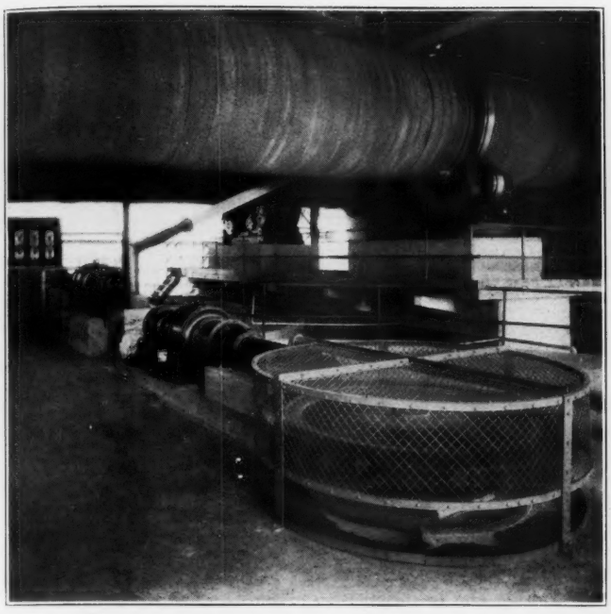
Raw Material Handling at Plant

The barges of raw material are tied up at the plant dock which is 600 ft. long and are unloaded by a stiff-leg derrick with a 90-ft. boom handling a 3-cu. yd. clamshell bucket. This is operated by a 3-drum hoist driven by a 175-hp. motor. A separate hoist controlling the swing is driven by a 30-hp. motor. The hoists and controls are in a neat concrete and steel building at the south end of the dock. The derrick discharges the shale and limestone to a 400-ton total capacity steel bin alongside the raw storage building which is 220 ft. long by 100 ft. wide and has capacity sufficient for 30 days' operation. An 8-ton overhead crane spanning the storage rehandles the material.

The shale and limestone do not contain the required amount of silica so this is added in the form of silica sand. This is dredged out of some of the nearby lakes and is shipped to the plant on barges. A 1½-cu. yd. locomotive crane handles the sand into two 50-ton capacity steel bins alongside the raw-storage building.

The overhead traveling crane feeds the limestone

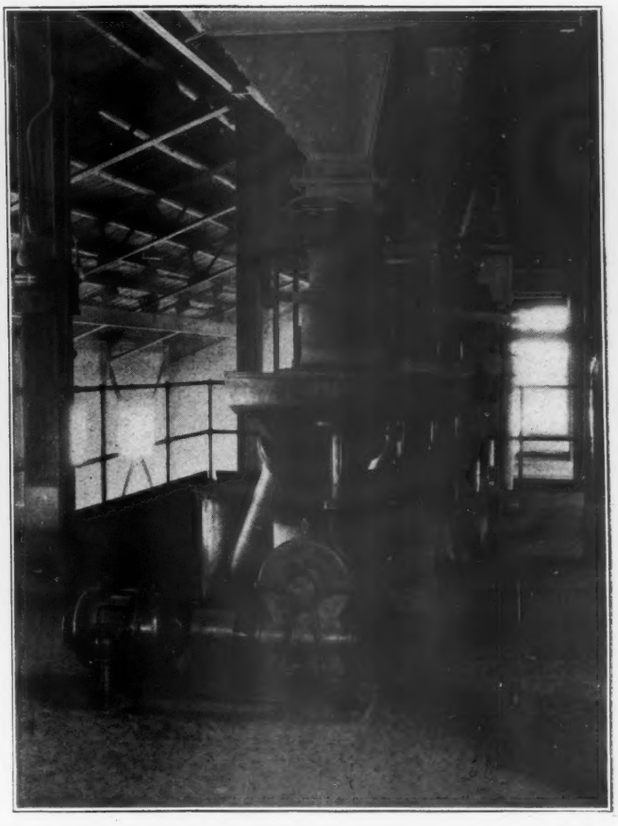
The two rotary kilns looking toward discharge ends. Slurry blending and mixing tanks in foreground



Agitators of slurry blending tanks under the kilns

into a 15-ft. pug mill with two sets of paddles revolving in opposite directions. The overhead crane also handles shale into a steel hopper from which a turntable feeder discharges to a 12-in. screw conveyor, driven by a 3-hp. variable speed motor through a speed reducer, which in turn discharges the shale into the pug mill with the limestone. Water is added and the limestone and shale are thoroughly broken up and mixed in the pug mill which feeds by an 18-in. screw conveyor 72-ft. long to the raw grinding mills. The two pug mill shafts are driven by a 75-hp. motor through a silent chain drive and the long screw conveyor by a 25-hp. motor through a worm-gear speed reducer.

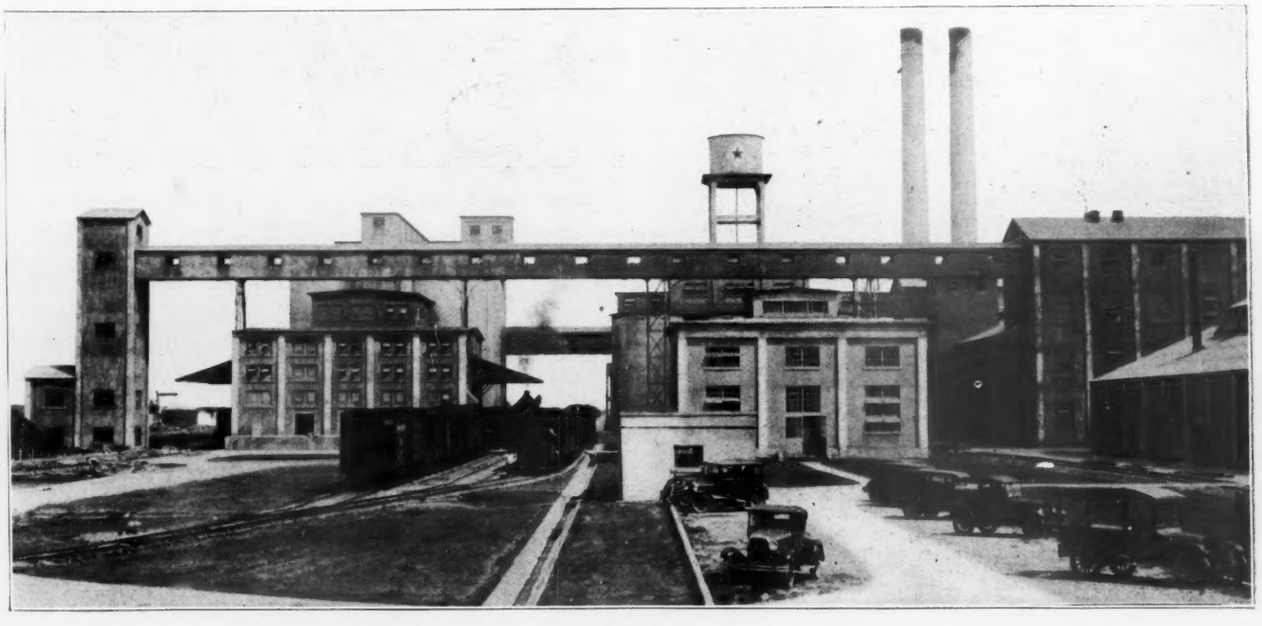
The sand is taken from the bins by two revolving plate feeders, similar to the one used for shale,



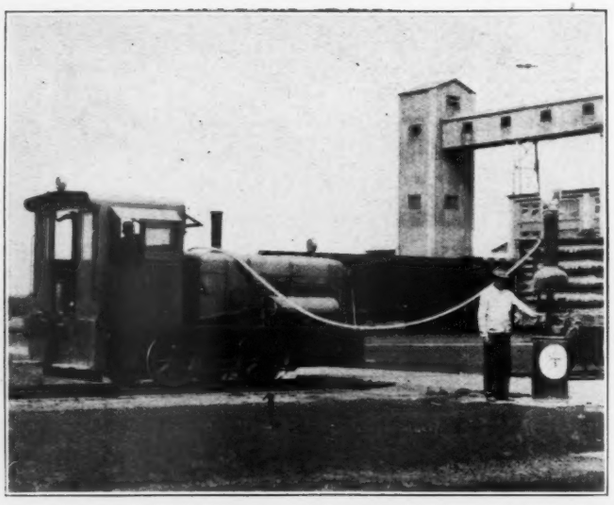
The four plate feeders which feed gypsum and clinker to the finishing mills

and is fed to a screw conveyor. This conveyor discharges into the same screw conveyor which carries the mixture of limestone and shale to the mills, mixing with it as it goes. The sand conveyor is driven through a speed reducer by a 20-hp. motor which also drives the feeders by chain through another speed reducer.

The conveyor from the pug mill discharges through sliding gates into either or both of two



Lone Star plant from west, with pack-house at left and power house in center



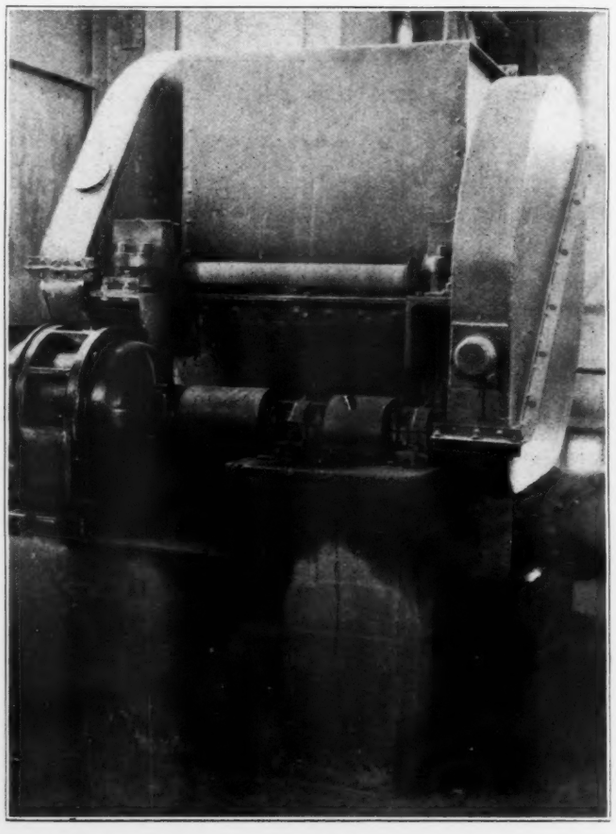
Refueling the gasoline switching locomotive at the plant

Kominuters, each of which is driven by a 125-hp. supersynchronous motor through a special gear drive. These reduce the material to the size of coarse sand and leave very little for the tube mills to do.

The Kominuters discharge into an 18-in. bucket elevator on 45-ft. centers which lifts the mixture into a mixing trough with a horizontal agitator. Two pipes feed the mixture into check-pots at the feed ends of the two raw-grinding tube mills. Samples are drawn here for tests to determine the chemical analysis of the mixture. The tube mills are each 7 ft. in diameter by 30 ft. long, and are driven by 650-hp. supersynchronous motors through direct-gear drives.

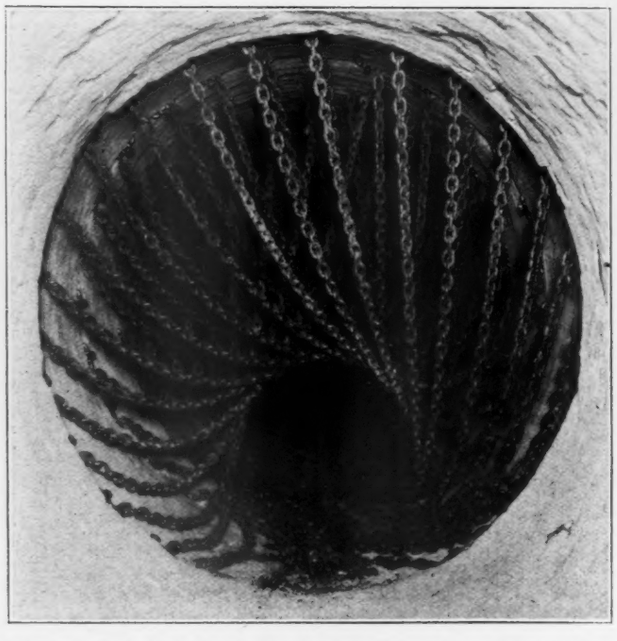
The tube mills discharge to two 16-in. elevators on 28-ft. centers which feed a series of 16-in. screw conveyors. These discharge into three concrete slurry correcting basins, each 20 ft. in diameter and 20 ft. high. These have both mechanical and air agitation. Frequent samples of slurry are taken here and analyzed in the laboratory. From the results of these analyses the chemist has definite quantities of slurry drawn from the tanks to give the exact chemical composition desired.

A system of pipes and valves allows slurry to be fed from any of the tanks in any desired quantities to two 16-in. elevators which discharge into the two concrete blending basins. These are each 38 ft. in diameter by 28 ft. high and are fitted with mechanical and air agitators similar to those used in the correcting basins. As a final check, the slurry is again analyzed here.



Head end of one slurry elevator showing double-gear reduction drive

The blending basins feed by gravity to two elevators on 80-ft. centers which lift the slurry to a 25-ft. slurry feed trough above the kilns. This has a horizontal screw agitator in the bottom. Two ferris-wheel feeders discharge to a mixing pot where dust recovered from the kiln chamber is added by an elevator. The discharge to the kilns is by gravity. Each of the slurry elevators is driven by enclosed double-reduction spur gears by a 10-hp. motor and the slurry feeder by a 3-hp. variable-speed motor through silent-chain and speed reducer drive.

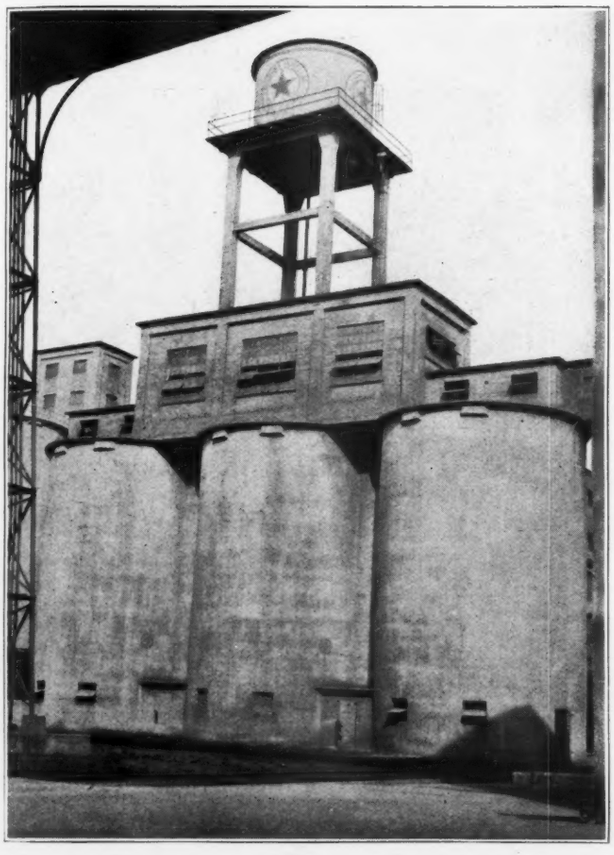


The suspended chains in the drying zone of one of the kilns

Kiln and Cooler Operation

The two 219-ft. kilns are 9 ft. in diameter for 75 ft. at the burning end and 8 ft. in diameter for the remaining length. Each is driven by a 60-hp. motor through silent-chain and triple-gear reduction drive. All machinery operated in connection with the kilns is regulated from a conveniently located control board.

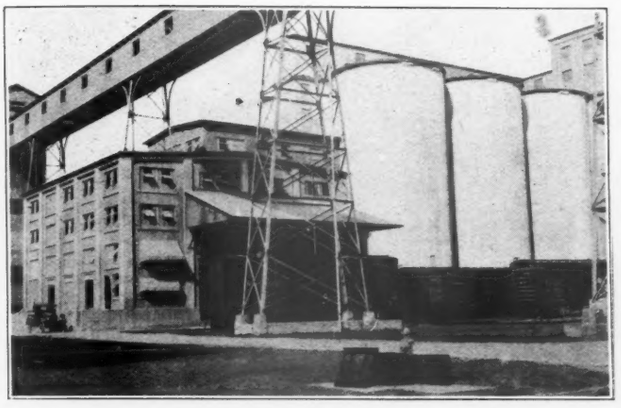
Recording pyrometers show the temperature of the gases leaving the kilns. These gases pass through dust chambers at the base of the stacks.



Two clinker silos at right, gypsum silo at left, and water tank above

The dust collected here discharges into two concrete silos from which it is taken by screw conveyor and elevator to the mixing pot of the slurry feeder which was previously described. Kiln draft is furnished by two conoidal fans each driven by a 60-hp. motor, one through silent chain and the other through a rope drive. Stack draft gates are controlled by hand-operated speed reducers with a ratio of 31 to 1.

The two coolers are each 80 ft. long by 8 ft. in diameter and are placed below the kilns. They are each driven through a silent-chain drive by a 25-hp. motor. Both coolers discharge into the same 80-ft. Skipulter conveyor which takes the clinker to a 60-ft. elevator to another Skipulter. This discharges into two of three concrete silos each 32 ft.



Cement packhouse at left, storage silos at right

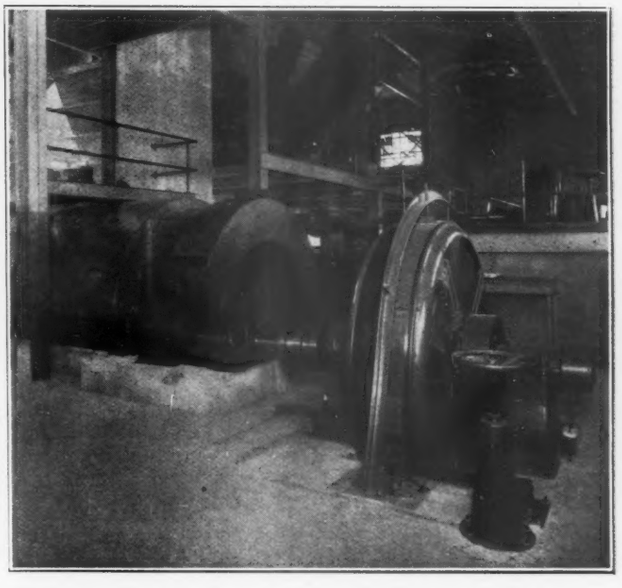
in diameter by 50 ft. high. The third silo is used for gypsum storage.

A 50-ft. elevator feeds clinker from the silos to another 80-ft. Skipulter which feeds the grinding mills. Another elevator feeds gypsum to the same Skipulter when clinker is not being handled.

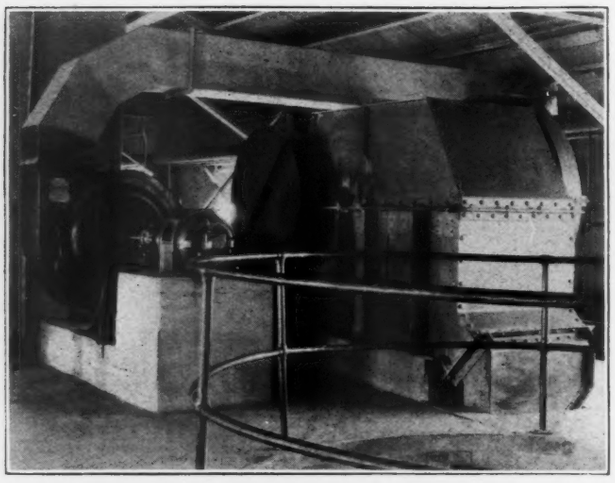
Finish Grinding

This Skipulter feeds clinker and gypsum to four steel bins, one bin in each pair being for clinker and one for gypsum. Plate feeders under each bin feed these materials from the bins in the desired proportions. Each unit of two feeders is driven by a 3-hp. motor. This drives the clinker feeder through a speed reducer with a ratio of 11.66 to 1. The gypsum feeder is driven from the drive shaft of this feeder through another speed reducer. The two preliminary grinding mills are each driven by 300-hp. supersynchronous motors. The discharge from these mills is carried by a screw conveyor to an elevator which discharges into the two steel tube mill feed bins.

The two finish tube mills are similar, except in



Preliminary raw grinding mill, with motor and special gear drive at right



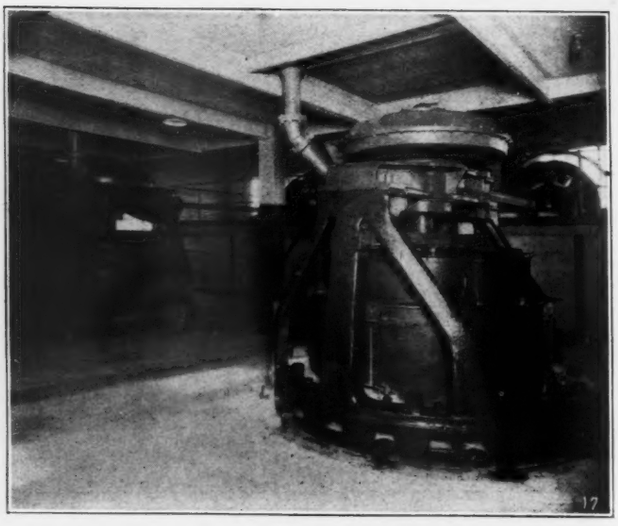
Centrifugal blower for dust-collecting unit at left, head of elevator at right

feed, to the two raw grinding mills adjacent to them. They are each 7 ft. in diameter by 30 ft. long and are direct-gear driven by 650-hp. super-synchronous motors. They discharge into a series of screw conveyors and elevators to the storage silos. The finish mills are operated only at night in order to keep the power consumption as uniform as possible at all times. Two dust-collecting units in the mill room collect dust from the preliminary finish mill discharge chamber and the screw conveyor from the mills to the packhouse.

Gypsum is received in box cars and is discharged into a track hopper. A screw conveyor feeds an elevator which discharges into the storage silo alongside the clinker silos previously described, or the feeding system as desired. The remainder of the gypsum handling was described in connection with the handling of the clinker.

Cement Storage and Packing

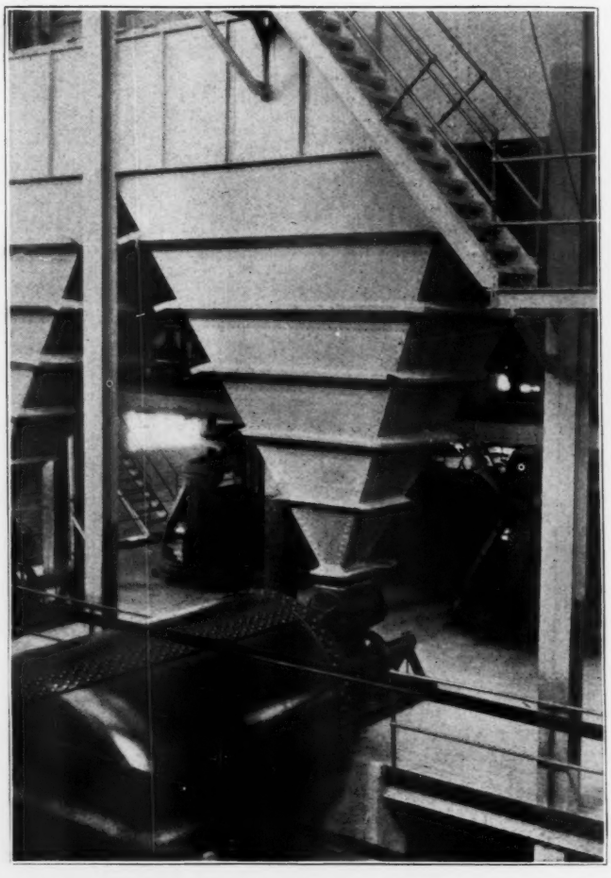
A series of screw conveyors on top of the cement storage silos distribute the cement to storage.



The preliminary finish grinding mills

There are eight of these silos each 30 ft. in diameter by 76 ft. high which, with the star bins, have a total capacity of 125,000 bbl. Each of the silos feeds through short screw conveyors into two 16-in. 150-ft. screw conveyors. These, in turn, discharge to two 25-ft. elevators which feed two more screw conveyors discharging into the bins over the four Bates 3-bag packers.

The four packers are in two units feeding onto two horizontal belt conveyors which can be run in either direction. Running in one direction they load into railroad cars on both sides of the packing building. When the conveyors are reversed they discharge onto a short roller conveyor which can



Feed tanks for finish grinding mills. Preliminary finish grinding mills in background

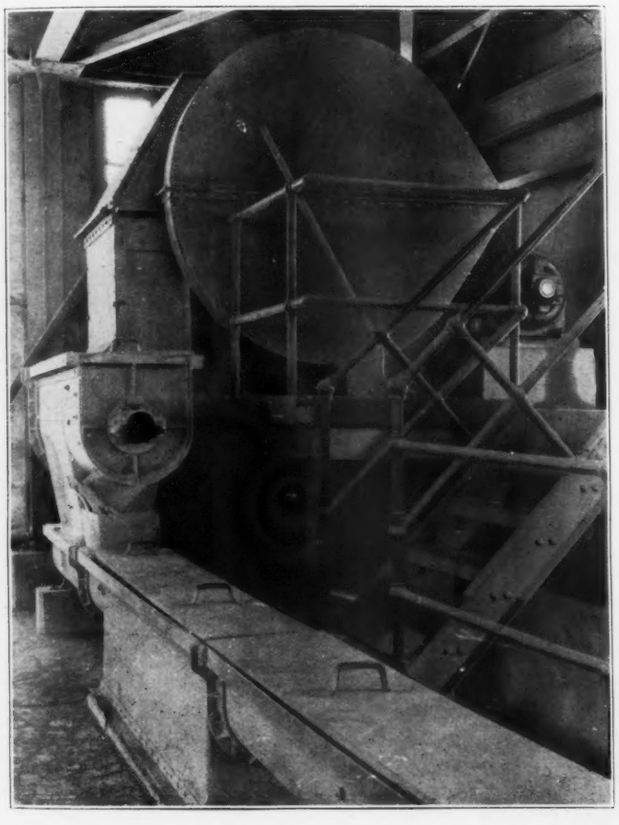
be tilted. Tilted in one direction it feeds a short belt conveyor to the truck-loading platform at one end of the building. Tilted in the other direction, the sacks feed to a 30-in. belt conveyor on 600-ft. centers, which is enclosed for its full length, to the dock. Here it discharges onto a counterbalanced boom conveyor which can be raised or lowered to load into ships or barges. The long conveyor is driven by a 20-hp. motor through a worm-gear speed reducer and drives the boom conveyor by chain from its head pulley.

The packhouse also contains a number of springless dial scales on which occasional bags are

checked. Empty sacks are loaded from cars onto an inclined belt conveyor to the second floor. A bag cleaner of the company's design on the first floor discharges onto the same conveyor. The bags are then counted, tied and stored away until needed. A dust collector is used on the bag cleaner, the dust collected dropping into a small bin. Another dust-collecting unit feeds the dust from the packers back into the packer feed bins.

Fuel-Oil System

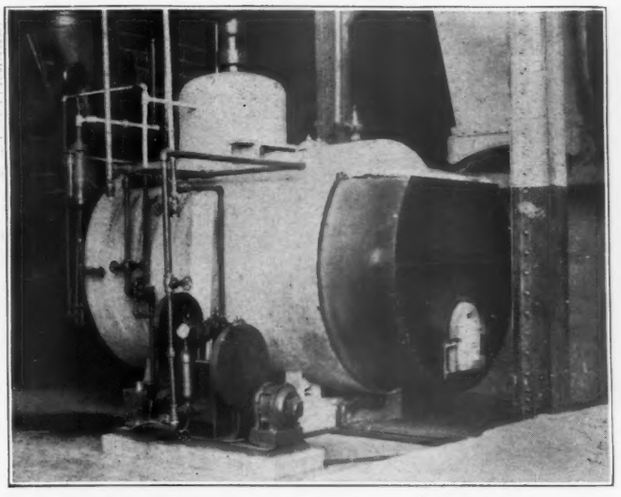
As previously stated, the plant was originally designed to use powdered coal for firing the kilns. This was used until the summer of 1929 when a fuel-oil burning system was installed. This change was made because of the high cost of coal in that section of the country and the low price at which oil could be obtained from the nearby oil fields.



Elevator and screw conveyors carrying kiln dust to kiln feeder

A concrete fuel oil tank of 10,000-bbl. capacity was installed in a corner of the property. This has been covered with two feet of earth to conform to underwriters' specifications due to the plant being within the city limits of New Orleans. The resulting mound has been sodded and does not detract from the landscaped appearance of the property.

A concrete pump house built adjacent to the tank houses three pumps which feed the oil through a pipe line to the kiln building. The conveyor tunnel formerly used for handling coal was used to house



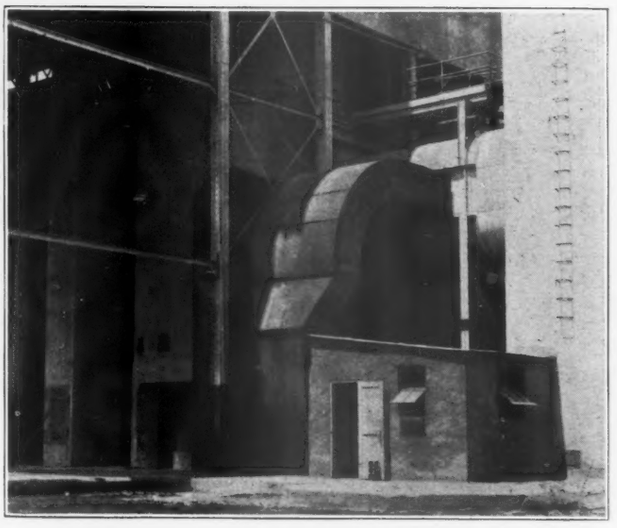
Insulated boiler which preheats fuel oil for kiln firing system

the oil pipes. Near the kilns is the small asbestos-insulated oil-fired boiler used for preheating the fuel oil. A small pump feeds the boiler from the fuel line. A two-cylinder 22-in. by 16-in. feather-valve air compressor driven at 225 r.p.m. by a direct-connected 300-hp. synchronous motor furnishes air at 30-lb. pressure for the kiln feed. A small 5½-kw. generator, belt-driven from this motor, is used for excitation of the motor fields.

Water used in the manufacture of the cement is pumped from the canal by two 6-in. centrifugal pumps to a 20,000-gal. concrete water tank supported above the clinker and gypsum silos. This tank has the Lone Star emblem, which distinguishes the company's product, emblazoned on four sides.

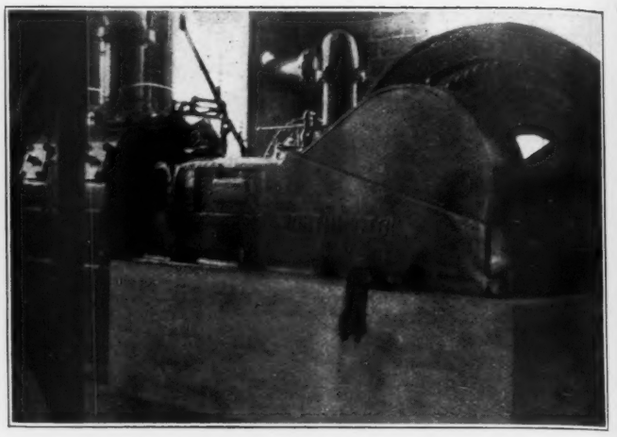
Power

The power house at the plant is one of the main buildings and houses all of the most important electrical equipment. Power is purchased at 13,000 volts from the New Orleans Public Service, Inc.,



Blower house and pipes for kiln draft; slurry elevator to kiln feeder at left

Interior view of machine and blacksmith shop



Compressor for kiln-firing fuel-oil system

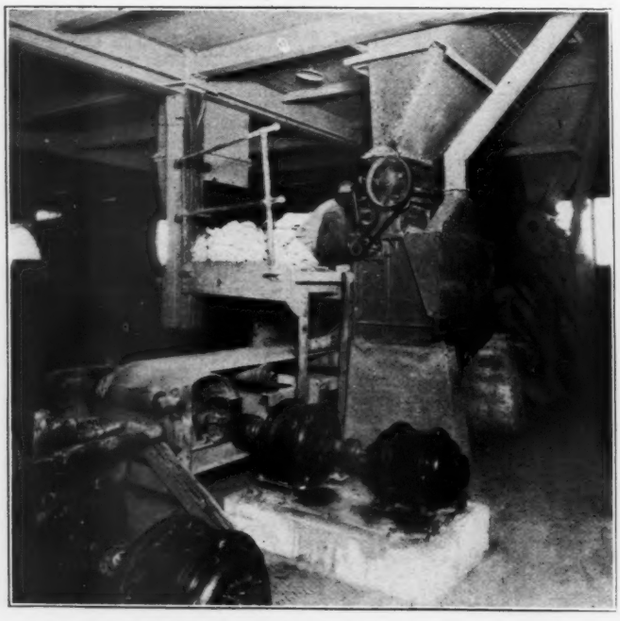
and reduced to 2,300 volts by four 1,000-kva. transformers. This voltage is used for all of the eight supersynchronous motors and the compressor motors. Four 333-kva. transformers reduce current to 440 volts for the smaller motors. Two autotransformers reduce the 2,300-volt current to 1,100 volts for starting the supersynchronous motors. One hundred and ten volt current is used for lighting purposes.

Two generating sets with 200-hp. motors driving direct-connected 125-kw. generators furnish direct current for excitation of the supersynchronous motors and for operating the kiln-feed motors. Compressed air for slurry mixing and other purposes is furnished by two 12-in. by 10-in. air compressors each driven by a 75-hp. motor. Power is transmitted from the switchboard to the various departments through an up-to-date underground transmission system.

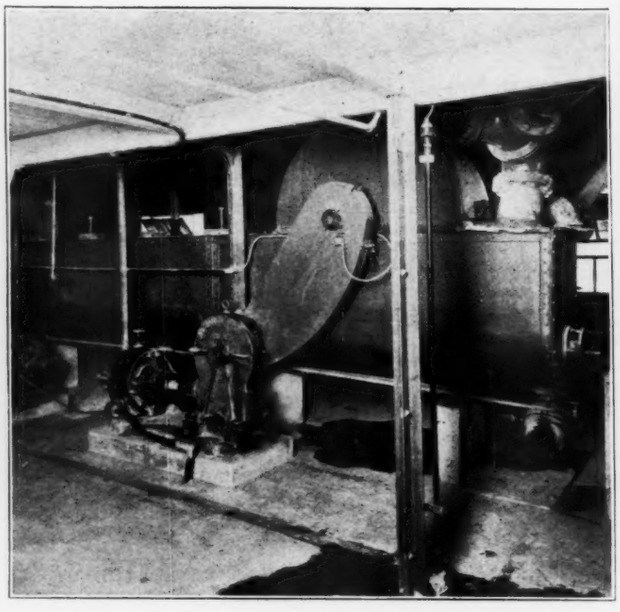
Miscellaneous

The plant was designed by the International corps of engineers who made ample provisions in the design for any future increase in capacity. A third kiln and any other necessary machinery can be installed without interference to operations. In the interests of safety and the elimination of all possible dust, all gears, chains, screw and belt conveyors, elevators and other exposed moving parts are enclosed in steel or concrete housings. Most of these are driven through speed reducers while the pug mill, all bucket elevators, the slurry feeder and the clinker coolers are driven through silent-chain drives.

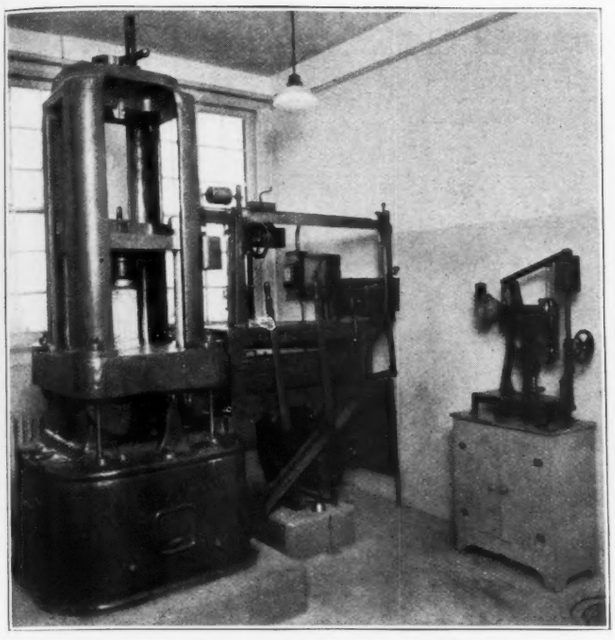
The office building, a neat two-story concrete structure, located near the ornamental gates which give access to the plant, houses not only the plant offices but the chemical and physical laboratories



Conveyors from bag packers, with speed reducer drives in foreground



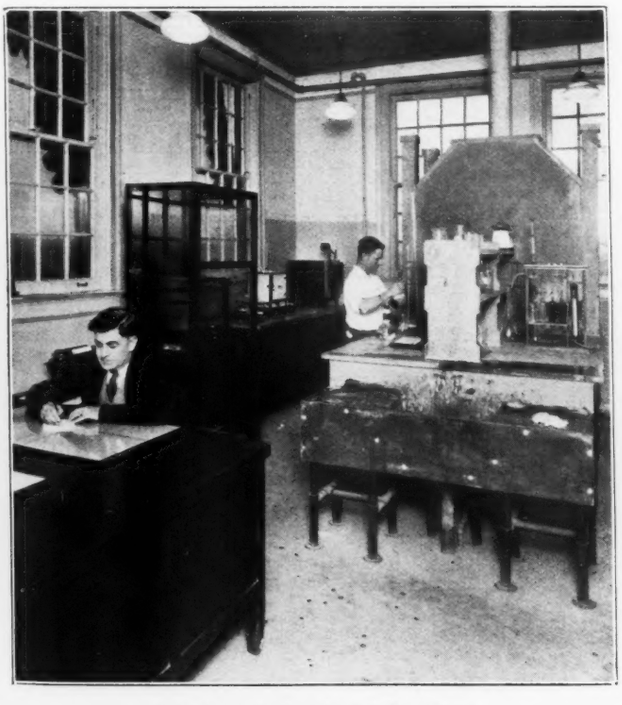
Slurry feeder, with chain and speed-reducer drive in foreground



Compression testing machine in physical laboratory

as well. These are equipped with all of the modern scientific appliances which enable the chemist to maintain quality control throughout the various operations in the manufacture of cement.

The employees are given every consideration and convenience for their comfort and health. The danger of injury is practically negligible and the cleanliness of the plant helps make working conditions more agreeable. Two modern rooms, equipped with individual steel lockers, showers, etc., are maintained. The employees also have their own baseball, basketball and bowling teams for those athletically inclined. All of these factors combine in developing the high morale and spirit of cooperation which is found among the employees in all International plants. The efficiency of the safety precautions taken is evidenced by the fact that up to February of this year the plant had gone thirteen months without an accident.



Interior of chemical laboratory

Most of the output of the plant is shipped by rail, although barge shipments are made to points on the Mississippi River and the Gulf Coast. Rail shipments are made over all roads entering New Orleans. The trade territory includes the state of Louisiana, most of Mississippi, and part of Arkansas. Some cement is also shipped to Central America.

Officers

The Lone Star Cement Company, Louisiana, maintains its office in the Hibernia Bank Building, New Orleans. Officers are: H. Struckmann, president; H. C. Koch, vice president; Scott Thompson, vice president and general manager. J. J. Oakes is plant superintendent. The main offices of the International Cement Corporation are at 342 Madison Avenue, New York City.

Months in a Year

(*Continued from page* 30)

to adjustable holidays, such as Labor Day and Thanksgiving, and we are reminded that the Nativity of Christ has been celebrated at different times in different places on other days than December 25.

The religious objections relate to the regularization of Easter and the shifting of the Sabbath, occasioned by Year Day, the extra day of December. Most of the Christian churches have declared themselves as favoring the stabilization of Easter, on condition that the various churches adopt the new calendar simultaneously.

In conclusion, it may be said with emphasis, that the advantages of stabilizing the unit of time far outweigh its disadvantages, and would bring simplicity and added efficiency into the economic and household affairs of the world.

First-Aid Teams to Compete at Louisville, Ky.

The U. S. Department of Commerce has announced the Ninth International First-Aid and Mine-Rescue Contest which will be held September 16 to 18, 1930, at Louisville, Ky., under the joint auspices of the U. S. Bureau of Mines and the Joseph A. Holmes Safety Association. The place for holding this meet was selected after the receipt of cordial invitations from the mayor of Louisville and the governor of Kentucky.

"Tru-Mix" Concrete Is Prepared in Three Seattle Plants of Pioneer Sand and Gravel Co.

Aggregates Are Received in Scows from Five Pits Along Neighboring Water Highways

By FRANCIS CHURCH LINCOLN,
Professor of Mining, South Dakota State School of Mines,
Rapid City, S. D.

THE Pioneer Sand and Gravel Company began operations 30 years ago, and was incorporated in 1910. It does a large business in mixed concrete, which it sells under the "Tru-Mix" brand. It also produces immense quantities of sand and gravel and deals in general building materials. The company operates 24 scows from five pits on Puget Sound and Lake Washington to seven bunkers and three "Tru-Mix" plants in Seattle and to five bunkers in other Puget Sound cities. It maintains five warehouses stocked with building materials, and employs a fleet of about 75 motor trucks in the city of Seattle alone.

This company derives the greater part of its sand and gravel from the Pioneer pit on the shore of Puget Sound near Steilacoom, 30 mi. by air-line southwest of Seattle, a description of which may be found in the March 12, 1930, issue of PIT AND QUARRY. It also excavates sand and gravel from the Heeney pit on Maury Island, 18 mi. southwest of Seattle in Puget Sound; from the Friday Harbor pit on San Juan Island, in northern Puget Sound 72 mi. northwest of Seattle. and from the Fauntleroy pit on Puget Sound a few mi. south of the Seattle city limits. It has a small production also by dredging from Lake Washington at the mouth of Cedar River just southeast of Seattle. Although a considerable amount of this sand and gravel goes into "Tru-Mix" concrete, the amount so used is a small proportion of the company's total ouput.

The office of the Pioneer Sand and Gravel Company is at 901 Harrison St., Seattle, Wash. H. F. Ostrander is president, and D. L. Williams is vice-president and manager. L. A. Perry is consulting engineer and serves as superintendent of "Tru-Mix" plants. Before coming to the Pioneer Sand and Gravel Company, Mr. Perry was engineer in charge of concrete construction at Longview, Wash., from 1922 to 1927. He is the author of a paper on the "Hexagonal Slab Design of Concrete Pavement" in the Proceedings of the American Society of Civil Engineers, for November, 1925.

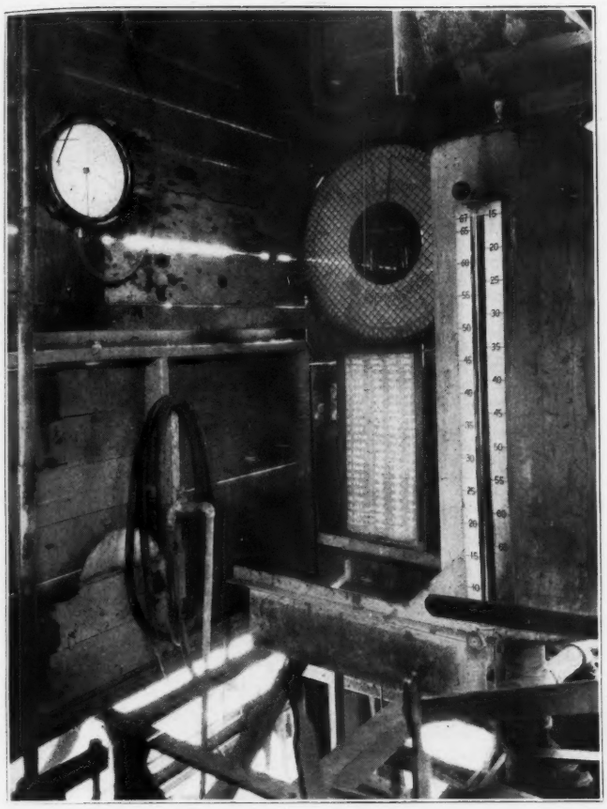
"Tru-Mix" Plants

"Tru-Mix concrete, ready to pour, proportions guaranteed," is supplied by three Seattle plants containing four concrete mixers. Sand and gravel are brought to these plants by scows from the pits mentioned. Portland cement is shipped to the plants in sacks by the carload from the Superior Portland Cement Company at Concrete, the Olympic Portland Cement Company at Bellingham, the Diamond Portland Cement Company in Seattle, and the Northwestern Portland Cement Company at Grotto. Aggregate, cement, and water, are properly proportioned, mixed, and delivered by truck anywhere within a radius of 40 mi. of Seattle.

The speed with which these plants can produce mixed concrete is well illustrated by a recent run made by No. 2 "Tru-Mix" plant. This is the largest plant of the company and is equipped with one 1-cu. yd. and one 2-cu. yd. mixers. These mixers were operated continuously for 17 hrs. supplying mixed concrete for St. Mark's Cathedral, Seattle, at an average rate of 100 cu. yd. per hour.

A fleet of 30 motor trucks is employed in the delivery of the mixed concrete. These are Kenworth trucks fitted with the bathtub type of body. Hoists and bodies were made by the Wood Hydraulic Hoist and Body Company of Detroit.

Pioneer pit which furnishes 80 per cent of company's aggregates, showing earlier method of hydraulicking



Charging floor, No. 1 plant

The machinery of the "Tru-Mix" concrete plants is driven by Seattle city electric power, both General Electric and Westinghouse electric motors being used.

No. 1 Plant

"Tru-Mix" plant No. 1, also known as the Spokane plant, is located on tidewater at Spokane St. and East Waterway, Seattle. Sand and gravel come to this plant on scows and are unloaded either to stock piles or directly into storage bins at the top of the plant. The bins are filled by a Link-Belt locomotive crane equipped with a Blaw-Knox

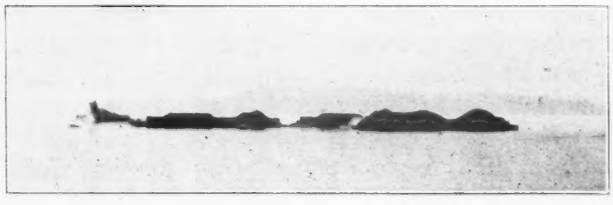
No. 1 plant, with Tru-Mix delivery truck and crane

L. A. Perry, consulting engineer for company and superintendent of the Tru-Mix plants

1¾-cu. yd. clamshell bucket. There are 4 bins, which have a total capacity of about 75 cu. yd. and hold respectively paving sand, paving gravel, building sand, and building gravel.

There is a cement platform at one side of the aggregate bins. The cement is raised to this platform by a belt conveyor from an adjacent warehouse. Sand and gravel run by gravity to a weighing hopper, while the cement is measured by the sackful on the cement platform and is dumped upon the aggregate in the batch hopper. The sand and gravel are weighed upon a 10,000-lb. Toledo springless scale on the operating floor of the plant.

Below the scale is a mounted table showing the quantities of gravel, sand, and water to be used in different mixes. Beside the scale is the water tank with a gauge like that of a boiler indicator and



Loaded barges, off Pioneer pit, ready for towing to mixing plants

marked with divisions in gallons running up on one side and down on the other. The water for the mix may be measured by filling the water tank to the proper point as indicated on the upward-reading scale and emptying the tank into the mixer, or by filling the tank full and drawing off water into the mixer until the proper point on the downward-reading scale is reached. The advantage of the double scale lies in the fact that, if too much water for the mix is drawn into the tank, the tank can be readily filled and the reading made downward instead of upward.

A recording pressure-gauge is employed, to indicate the consistency of the mix. This indicator was invented by L. A. Perry, and is being commercially developed by the Chain Belt Company, of Milwaukee, which has acquired the patent rights.

Aggregate, water, and cement are mixed in a 56S Rex 2-cu. yd. mixer, which is run by a 40-hp. electric motor and dumped into waiting trucks. The time of mixing is 1 minute unless otherwise specified, and is measured by a batch meter. A

No. 2 plant

Koehring electric batch counter records the amount of mixed concrete delivered to the trucks. A description of No. 1 "Tru-Mix" concrete plant as first constructed and operated will be found in PIT AND QUARRY for September 29, 1926; but so many changes have been introduced since that time that the old account is of little more than historic interest.

No. 2 Plant

"Tru-Mix" plant No. 2, also known as the Westlake plant, is on Lake Union at Westlake Ave. and Aloha St., Seattle, a short distance from the Harrison St. office of the Pioneer Sand and Gravel Company. As stated, it contains a 2-cu. yd. and a 1-cu. yd. concrete mixer. The general arrangement is similar to that at the No. 1 plant, save that there is not sufficient fall for complete gravity operation, and the mixed concrete has to be hoisted after leaving the mixers before being dumped into trucks. The reason for this lack of fall is that the plant was fitted into an old coal bunker. It is now

Scale, hopper and water tank at No. 2 plant

proposed to tear down this plant in the near future and to reconstruct it as an all-gravity plant, on the opposite side of Lake Union.

Gravel and sand arrive at the plant in scows of from 450 to 800-cu. yd. capacity. The scows are unloaded by means of a stiff-leg derrick equipped with a 2½-cu. yd. Owen clamshell bucket. This derrick employs a hoist made by the Clyde Iron Works of Duluth and driven by a 150-hp. General Electric motor. It unloads into a bunker or directly into the storage bins at the top of the "Tru-Mix" plant. The overhead storage at this plant is divided into five bins—a gravel bin of 150-cu. yd. capacity, a sand bin of like capacity, a paving-gravel bin of 75-cu. yd. capacity, a paving-sand bin of 60-cu. yd. capacity, and a pea- or roofing-gravel bin of 20-cu. yd. capacity.

Weighing hoppers are employed, and the arrangements on the operating floors are the same as at No. 1 plant save that the consistency indicators are not of the recording type. The 2-cu. yd. mixer is a 56S Rex with a capacity of 80 cu. yd. an hour similar to the mixer in No. 1 plant. It is driven by a 40-hp. motor and dumps into the 2-cu. yd. skip of a Wood hydraulic hoist operated by a

(*Continued on page* 64)

Engineer L. A. Perry beside Tru-Mix truck

Improvement in Sand-Lime Brick Machinery*

By E. D. CHURCH

THERE has been a great improvement in sand-lime brick machinery, and also in the quality of the product.

The first practical plant was built in Saginaw in 1901. The press was imported from Germany. The other units were built from German blue prints, which were very crude. A German engineer installed the machinery and started the plant.

In manufacturing brick it was necessary to maintain a large supply of quick lime, as sufficient lime had to be hydrated each day for use the following day. Buckets were filled with lime and placed under the cars that were loaded with freshly pressed brick. After steaming eight to ten hours, the lime was pulverized and ready for proportioning and mixing with the sand, which was done with a shovel.

The material was delivered to a differential mixer which passed it on to the agitator of the press. It was sort of an upright rotary press with a capacity of from 600 to 800 brick per hour, when it was not broken down, which it happened to be most of the time. Owing to the impossibility of getting more than a day or two service without a breakdown, we were obliged to scrap the press and try another; it was a twelve-mold rotary type, which gave much better satisfaction but was far from perfect. The capacity was from 1,800 to 2,000 brick per hour.

The liners were of medium soft steel and, when using a sharp sand, would have to be changed after pressing about 30,000 brick. We then faced the backing plates with a thin hard steel plate, and were able to produce from 200,000 to 2,000,000 brick without changing liners.

After running the press a short time there was considerable wear on the center bearing of the table, which caused it to tilt when pressure was applied and produced fins on the brick. Nothing could be done until there was space enough to put in a shim, several of which came with the press. To put one in it was necessary to take out the center shaft and lift the table enough to insert same.

We designed an adjustable bearing with sufficient adjustments to use up the brass bearing plate. Later, we discovered we were getting a wedge brick, and found that it was caused by the bottom of the plungers dragging over the lower pressure plate. We put plunger lugs on the table to hold the plungers clear of the plate, and had no further trouble.

The brake, to keep the table from running past the stopping point and holding it in place, while pressure is applied, was set all the time with an effect the same as though a brake was set on an automobile when running up a hill, resulting in a great loss of power and wear on the center table bearing. We now have a patented intermittent band brake that is set only when brick are being pressed.

The toggle shaft was a close fit in the toggle and under size. Some were bent and shoulders worn on the underside of the bearing, making it impossible to remove for replacement or, if the toggle shaft should turn in the toggle as it often did (as it was held with two set screws), a bur was raised making it impossible to take out without cutting apart, taking two to ten days, and invariably the shaft and toggle had to be destroyed. We redesigned the toggle and increased the size of the toggle shaft, which can now be taken out in a few minutes, and a new one installed at the same time, if necessary. The toggle is kept from turning by a feather key.

When the table top became scored, it was necessary to send it to a shop with a lathe or boring mill large enough to face it off. It was also necessary to do all the work in the shop as no two tables were slotted alike. Now the plates and tables are slotted to the same templet and require very little work to replace the worn tops. It is not necessary to disturb the table as the tops are in four sections.

Six twelve-mold rotary presses were imported. Were all built at one time. Not a single part of one was interchangeable with another. A repair part could not be furnished without a hole to drill or chip or file when received at the brick plant.

Now the table is fitted with high carbon steel plates, and when necessary to replace, can be removed by taking out a few screws and a new one installed, which will be a perfect fit, in a short time. Every bearing on the press is bushed and every part of the press is made with a jig and templet, and interchangeable with any press of the same type. It is not necessary to drill, file or fit a single part.

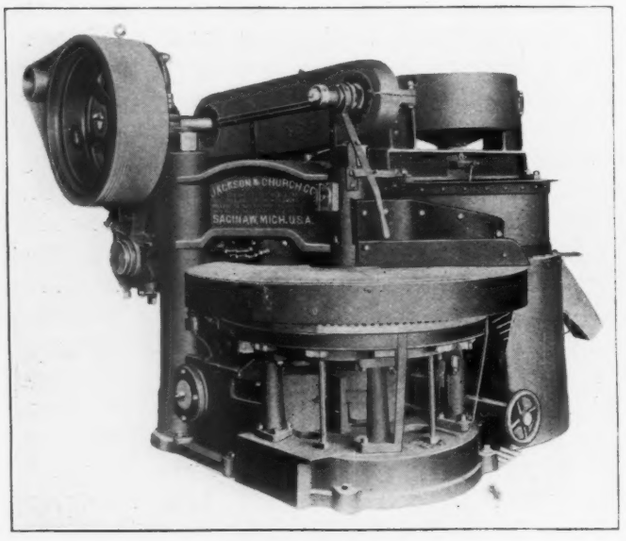
The presses are fitted with the Dot system for lubrication, and can be lubricated while the press is in operation.

An up-to-date plant is nearly automatic, which greatly reduces the labor cost. The operation is as follows:

If plant is located at sand supply, a dragline bucket moves the sand to a conveyor, which conveys it to the volumeter sand bin. When the bin

* Read Feb. 5, 1930, at annual meeting, Sand-Lime Brick Association, New York, N. Y.

is full the sand is deposited in the plant store room. The lime is taken from a silo with a screw conveyor and deposited in the boot of the lime elevator, and then in the lime volumeter bin. The sand and lime flow from their respective bins in any proportion desired on belts running to a common center. The speed of it can be adjusted for any ratio of sand and lime mixture. It is then deposited on a belt passing over a magnetic separator, and any pieces of metal that happen to be in the sand or lime are removed and the mixture deposited in the press material hopper and passed through an adjustable gate to the press agitator.



Modern sand-lime brick machine

If the sand or lime bridge in the bin and the flow decreases, a gong rings. If it continues to decrease, an electric hammer starts hammering, and before the decrease gets to the danger point, the sand motor is shut down. If at this point the lime begins to flow, by the bridge being broken, the sand motor starts and thus there is no chance of a lean mixture getting to the press.

A brief comparison of accomplishments is as follows:

From a press capacity of 2,000 brick per hour to a capacity of 3,600 per hour; to a complete duplication of all parts of machinery of the same type; and automatic preparing, proportioning and handling mixture, which practically removes the danger of the man who forgets.

From the old form of hydrating lime from day to day and the necessity of carrying a large stock of quick lime which deteriorates very rapidly from air slaking, as compared to the new method of hydrating a carload at a time, or if desired, enough for a year's run at one time.

Fort Worth Plant

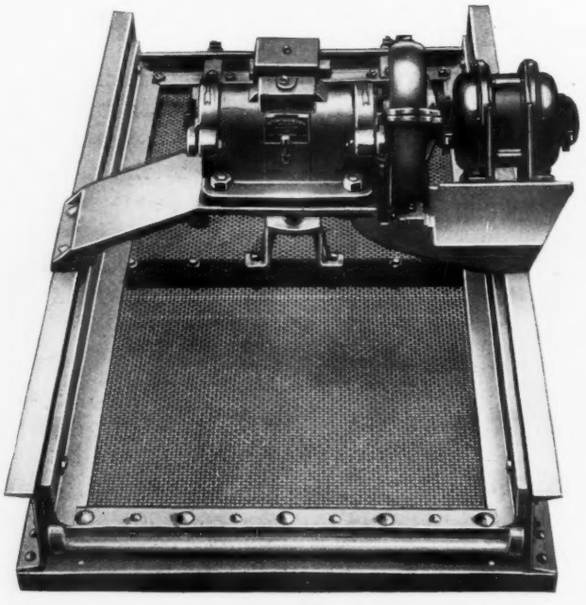
(*Continued from page* 36)

electric control room. Each motor can be started or stopped independently by pressing its remote-control button. An unusual device known as the electric trouble signal system signals an alarm whenever any one unit is not functioning properly.

The motors in the loading-out section are controlled from a room in that section.

A floodlight system makes operation as practical by night as by day. The demonstrated production capacity of the plant is 5,400 tons per 24-hr. day. The storage capacity reached by the tunnels is approximately 200,000 tons, or 1,000 carloads. Experienced operators can appreciate the advantages that attend this large and readily available storage. Production may be maintained for many days without any congestion and without loading out any materials. On the other hand, the loading-out operations can be conducted at the rate of 100 carloads per day for several days without any production.

This company sells large quantities of pit-run gravel to railroads for ballast. It is common practice for 50 ballast cars to be switched in for loading one day and perhaps only 5 cars the following day. The equipment and crew at the pit is adequate to handle the maximum demands, the pit expenses being practically the same on days when only 5 or 10 cars of ballast are loaded as on other days when 50 cars are loaded. On days when ballast loading is less than capacity, the material not required by the railroads goes to the washing plant and thence to the screens and storage without adding any expense.



One of the vibrating screens before its installation in Fort Worth plant

Mendip Mountain Quarries Company Maintains One of England's Finest Crushed Stone Operations

Road-Construction Materials Are Produced in This Thoroughly Modern Plant

By JOHN P. HANDSCOMBE
Manager, Mendip Mountain Quarries Company

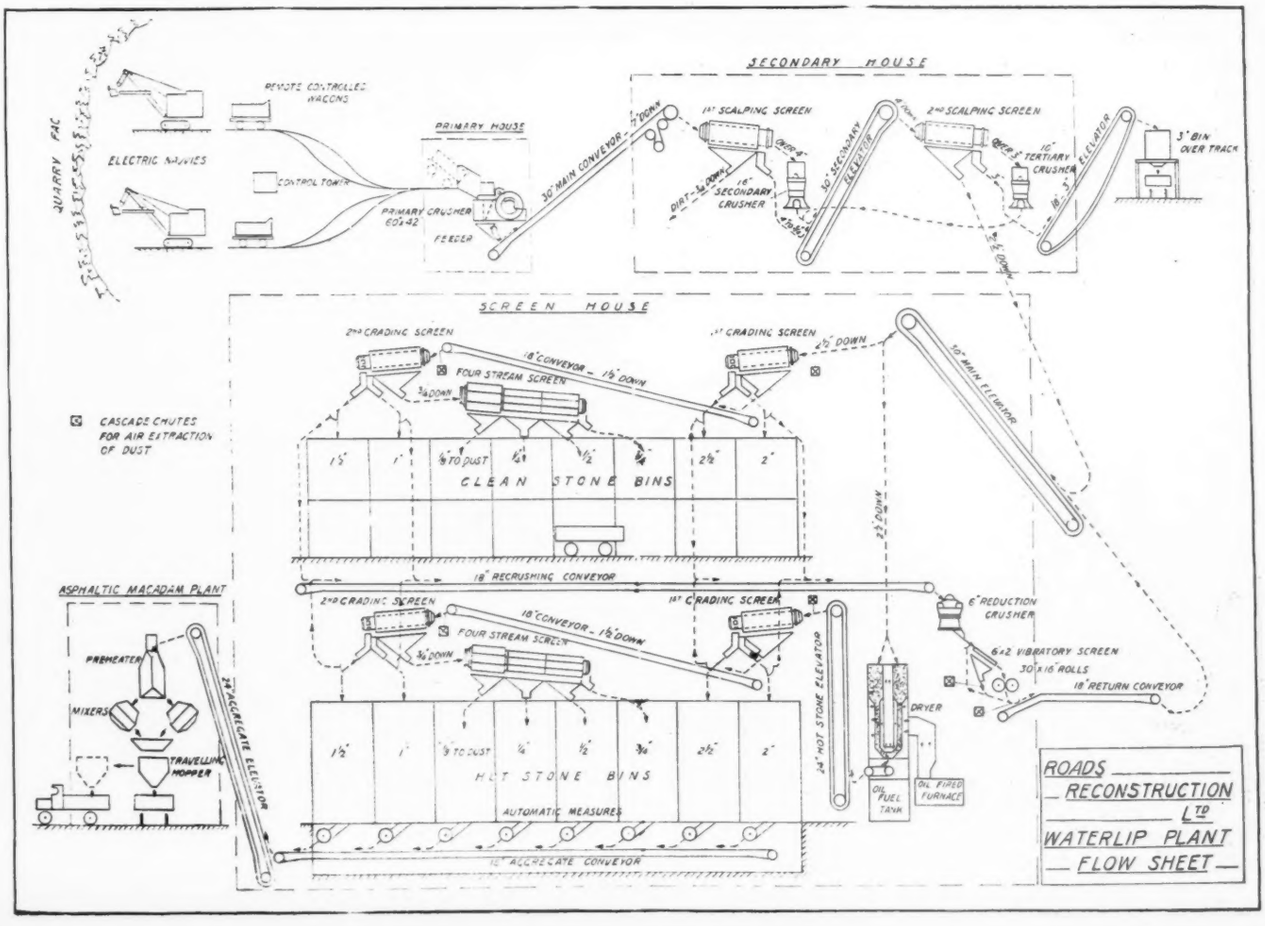
[*Our American readers will find interest in this authentic description of a new British crushed-stone plant, in noting the significant difference between the scales of operation in the two countries.—Editor.*]

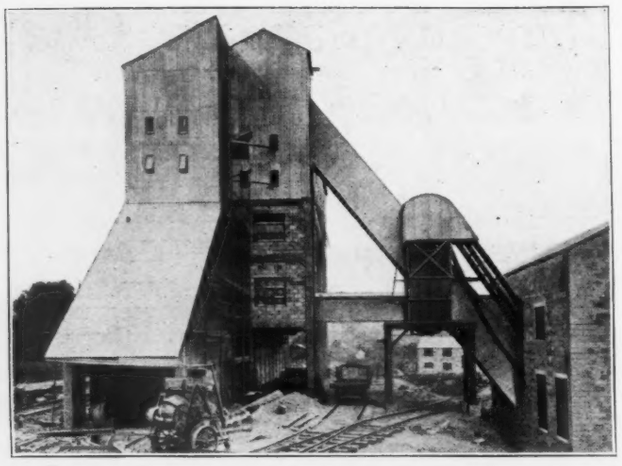
WATERLIP QUARRY lies in the eastern end of the Mendip Hills, Somerset, England, nearly 1,000 ft. above sea level. The Great Western Railway is connected with the quarry by a siding about 1¼ miles long, over which two Sentinel full-gauge locomotives convey trucks from the quarry plant to the main line for distribution.

The quarry had been worked for about sixty years in a most primitive way until 1924, when it was taken over by the present proprietors, Roads Reconstruction Ltd. of Bristol, England, of which company the Mendip Mountain Quarries Company is a branch.

Early in its ownership of Waterlip quarry, Roads Reconstruction Ltd. realized that a quarry of this description, producing as it did, an exceptionally tough limestone rock, having the appearance and strength of granite, with a crushing stress of about 31,000 lb. per sq. in., should have great possibilities. Its geographical position is most favorable for distribution over a wide area, including the London District, and railway freight charges made it possible to trade in that district and over a big area of southern England.

During 1924 a temporary plant was put in, capable of producing about 2,500 tons per week, and a scheme was conceived for the installation of a mass production plant more or less on American lines. Readers must bear in mind the fact that the outputs of quarries in England are not to be



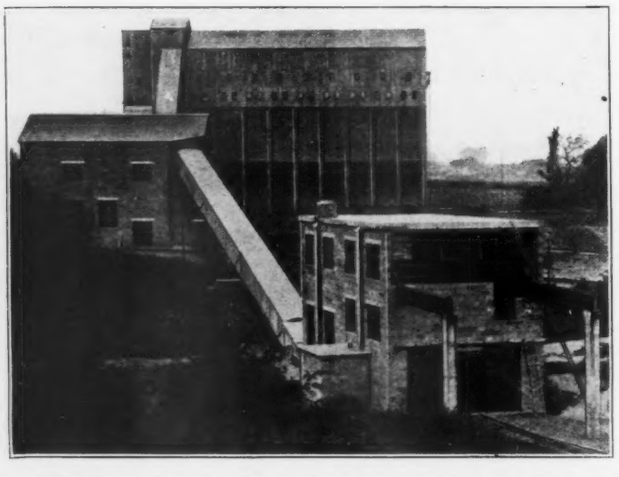


Bins and primary screen house (left), secondary screen house (right)

compared with those of America. Over here, a quarry with an output of 3,000 tons per week is in quite a fair way of trading. This is probably due to the difference in the comparative area of England as against America, quarry land being prevalent in most parts of England, making it difficult for any individual quarry to trade outside a certain zone—its own natural distributing area.

James Watt, the company's late engineer, visited America in 1924 and a complete scheme for mass production of roadstone was prepared and put in hand in 1925, and was completed in 1927. The new works were eventually opened on September 29, 1927, by Sir Henry P. Maybury, K.C.M.G., C.B., who at that time was director-general of roads for Great Britain.

The first consideration, after arriving at a decision to lay out a mass-production plant, was the question of power. As it was not considered expedient at the time to put down a generating station, it was decided to buy power from The North Somerset Electric Light and Power Company Ltd., which undertook to run a cable to the quarry and to supply in the first place up to 500 kw. Electricity is delivered to the works at a voltage of 11,000 and is transformed to 500, 400 and 230 respectively, for the various motors which are referred to subsequently.

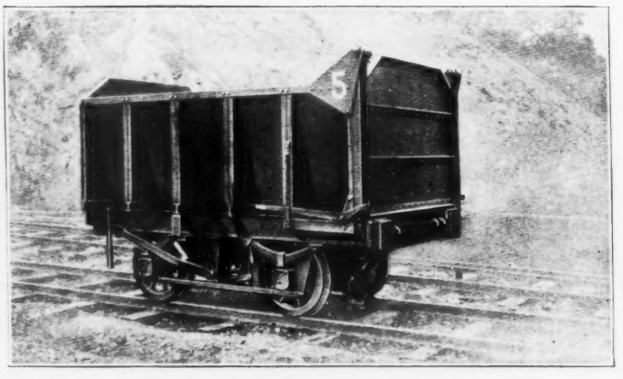


Storage bins, crushing plant and screening plant

It is not proposed in this article to deal with the question of costs of production under different headings, about which a great deal could be said, but to confine the notes to a complete report about the installation.

Quarry Practice

Waterlip Quarry has a face about 500 yd. long, with the stone lying in beds about 4 ft. to 6 ft. thick at an angle of 60 deg. The quarry face is 60 ft. high, and there is a good depth of rock below the quarry floor level. Quarrying has been carried out by (a) mining, (b) well-drill sinking, and (c) Jackhamer and light tripod drilling. In the case of (a), mines were made by penetrating about 30 ft. into the foot of the face of the quarry, and by cross-cutting in the T shape. As regards (b), a Keystone drill, electrically driven, was used, and (c) Ingersoll X71 light tripod drills and Jackhamers. Of the three methods, (c) has been found the most economical, and the most encouraged. Hand and tripod drilling is the cleanest method of quarrying, and least costly in explosives. Abelite Ammonal and Gelignite explosives were used, with Cordeau-Bickford for detonation, in connection with the mines and well holes.



Remote-control quarry wagon

Remote Control Haulage

Before passing to the primary crusher house it will be interesting to readers to hear a little about the control house. This is situated centrally in the quarry at a distance of 350 ft. from the quarry face, and controls the quarry cars and the electric navvies. For this purpose the lower part of the house is fitted with a motor and a generator, the latter producing d.c. which is supplied to the motors on the quarry cars by the live-rail system. For the navvies, current is received in this building at 11,000 volts and transformed to 500 volts. The upper tower of the building is the operator's room.

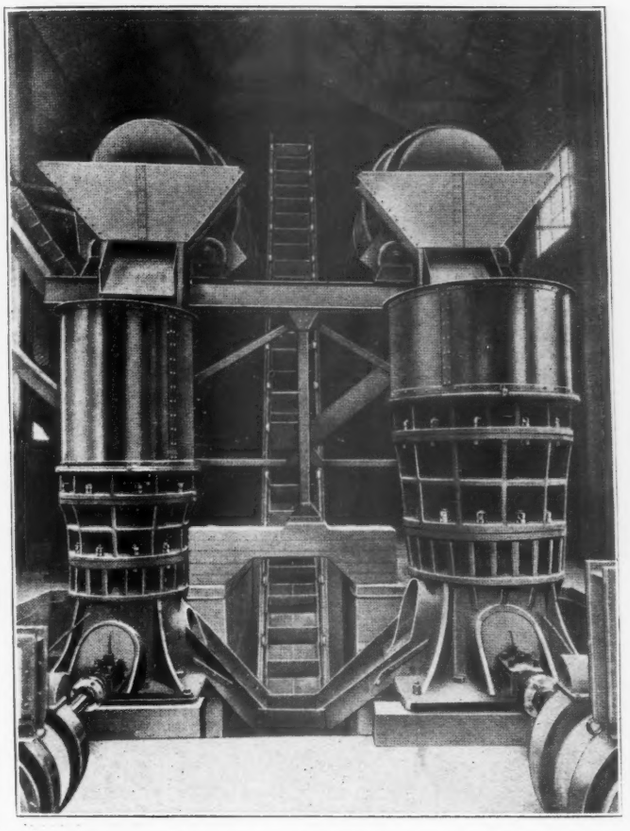
The quarry railway is divided into eight control sections. By the use of switches, the operator

can start trucks in motion in any of these eight sections. He has a complete view of the quarry face and operation right up to the entrance to the primary house. My own experience is that this system of traction is the most reliable I have known and is capable of transporting more material in a day than any other system I have tried.

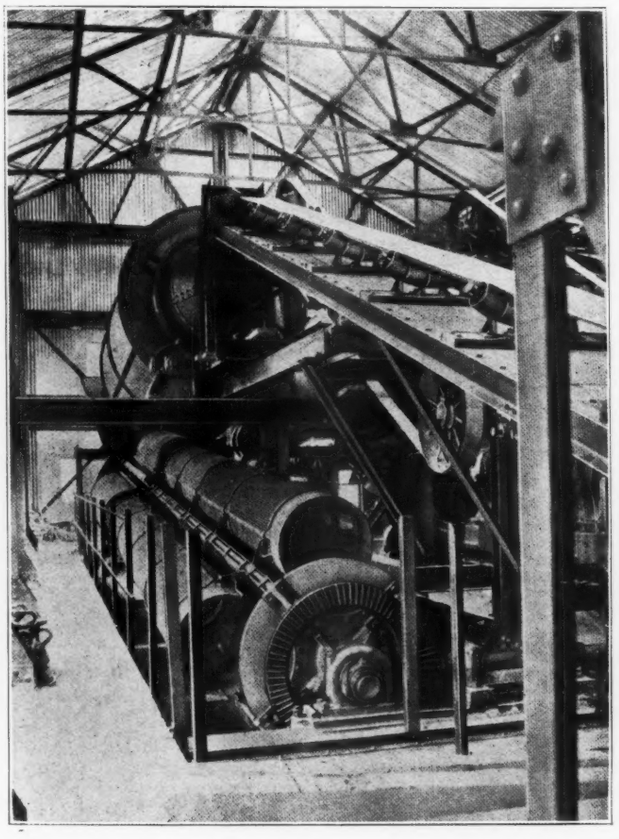
Material is loaded mechanically by two Ruston electric crane navvies on caterpillars with special rock-type buckets of 2¼ cu. yd. capacity. The navvies are fitted with electrical gear of 500/550-volt capacity, 3-phase, 50-cycle. These navvies load the stone into 15-ton steel wagons, of which five are used. These are driven electrically by self-contained motors, and run on a 4-ft. 8½-in. track fitted with single live rail. The wagon motors are driven by 230-volt d.c. and are remotely controlled. The stone is delivered to the primary crusher, a 60-in. by 42-in. Marsden jaw-type, by the 15-ton wagons, which are lifted and tilted on a steel table by a 35-ton Morris electric crane.

Crushing and Screening

The primary crusher is driven by a 200-hp. English Electric Company motor, running at 733 r.p.m., and itself runs at 108 r.p.m. The capacity of this crusher is 240 tons per hour maximum, but its average is only 120 tons per hour. The crushed 8-in.-down rock, after passing down the crusher chute, is fed into a conveyor by a Ross feeder, and travels up a 30-in conveyor belt set at an angle of 1 in 3, to the secondary building, 200 ft. away. Here the first scalping takes place. All material from 1¾ in. to dust is scalped out and passes outside the building, firstly into an elevator, onto a short conveyor, and then through a ¾-in. square-hole wire-cloth screen, where the ¾-in. to dirt is taken out and discharged onto a conveyor belt for delivery into tubs or wagons for waste.



Secondary crusher and primary screen (right), elevator (center), tertiary crusher and secondary screen (left)

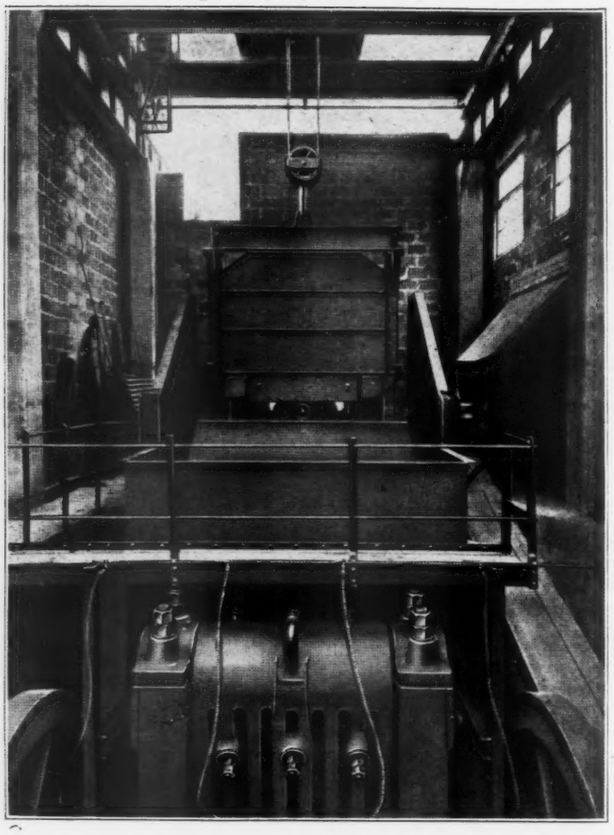


Secondary screens above, 4-stream screen for chippings below

The 1½-in. to 1-in. passes over a belt for hand-picking and is delivered into a 20-in. by 5-in. Goodwin granulator for making into ¾-in.-down chippings.

The 8-in. to 2-in. stone passing the scalping screen is separated in two grades, 8-in. to 4-in. and 4-in. to 2-in. These separated grades pass over three picking belts—one for the former and two for the latter—to be hand-picked before entering the secondary crusher. The coarser stone, after picking, returns to the secondary crusher and, after crushing, is discharged into the secondary elevator. This secondary crusher is a 16-in. Hadfield gyratory and is direct-coupled to an English Electric Company 363 r.p.m. slip-ring motor, and is provided with a cylindrical steel feed hopper.

The 4-in. to 2-in. stone, after picking, also returns to the secondary elevator, and the whole is elevated to a second scalping screen. Through this screen, consisting of 2½-in. outer and 3¼-



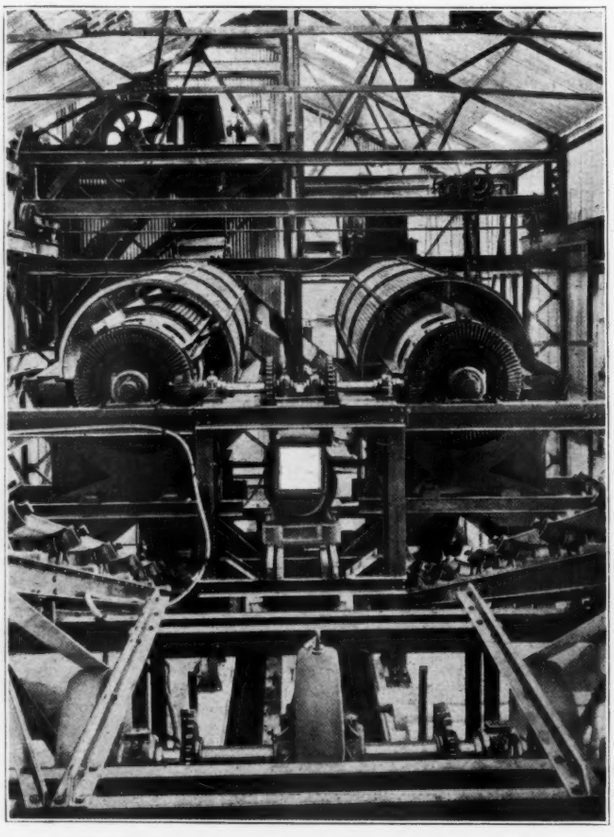
Primary crusher house, crusher in foreground

in. inner ringed plates, the material is separated into three sizes: 3-in., which travels up a separate elevator outside the building into a separate steel storage hopper; 2½-in.-down, which passes to the main elevator; and the size above 3-in. which discharges into a 10-in. Hadfield gyratory tertiary crusher.

The material passing through this crusher also discharges into the secondary elevator mentioned above. This Hadfield 10-in. gyratory crusher is driven by an English Electric 50-hp. motor running at 413 r.p.m. and is also fitted with a cylindrical steel feed hopper. Any surplus 3-in. stone is discharged down a chute into a 16-in. elevator which takes the stone and deposits it into a steel hopper. The hopper feeds three crushers: one 24-in. by 15-in. Marsden and two 20-in. by 10-in. Broadbent jaw-type crushers, fed through Ross chain feeders. The recrushed stone discharges onto a conveyor, where it is taken for discharge into the secondary elevator previously mentioned. The whole of this recrushing unit is driven by a 75-hp. English Electric Company Kosfi motor. This latter motor, incidentally, was put in together with another 50-hp. to rectify the power factor to the figure required by the company's electricity contract.

The crushing process having now reduced the stone to the desired sizes, the material, 2½-in.-to-dust (the 3-in., if any, having been elevated to a separate hopper) travels in the main elevator to the screen house and storage bins. This, again, is a 30-in. bucket elevator driven by 35-hp. English Company slip-ring motor. On discharge at the top of the elevator, the stone drops into a V chute, where about 60 per cent of it goes to a vertical static dryer (made by Priest Furnaces Ltd., Middlesborough, England), and the other 40 per cent through a 2½-in. and 2-in. grading screen. These two sizes are screened out and discharged into bins each of 150 tons storage capacity. The 1½-in.-to-dust travels by conveyor to the second grading screen of two sizes, viz., 1½-in. and 1-in. and the ¾-in.-to-dust is screened out and discharged into a four-stream patent Pool screen. The latter screen separates the stone into ¾-in., ½-in., ¼-in., and ⅛-in.-to-dust, so that, in all, the sizes we have are: 3-in., 2½-in., 2-in., 1½-in., 1-in., ¾-in., ½-in., ¼-in., and ⅛-in.-to-dust.

As regards the material to be dried, which is the larger quantity (approximately 60 per cent), this breaks over the V chute from the main elevator and cascades to the dryer. This dryer, which is of 60-tons-per-hour capacity, has a receiver at the top in the form of a rotating chute which distributes the stone equally in the dryer. This rotating feeder is driven by a 3-hp. electric motor. The dryer, which is 37 ft. high and 11 ft. 6 in. in diameter, is heated by an oil furnace, where crude oil is used in four burners. The hot air is drawn into the dryer by a high-pressure



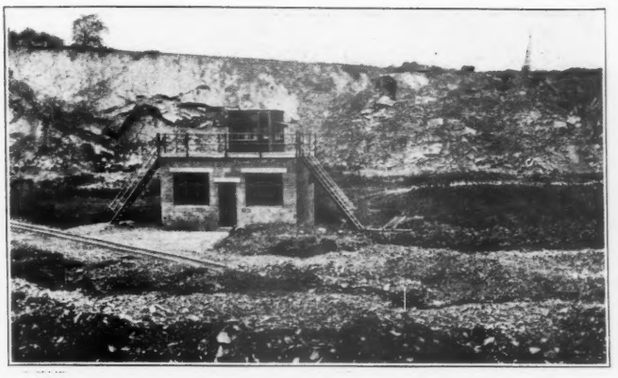
Main elevator (upper left) and primary screens

suction fan driven by a 10-hp. motor at 2,900 r.p.m.

All dried stone is discharged into a vertical 24-in. hot-stone elevator, driven by a 15-hp. motor through worm-and-chain gear, where it is delivered into a series of screens similar to those above described for undried stone, and where the stone is screened in exactly the same way, with the exception that the dried-stone bins are double the capacity of the others, being 300 tons each. A central conveyor belt is fitted, running between the centre of the two rows of hot-stone and cold-stone bins, onto which any stone from the 2½-in., 2-in., 1½-in., or 1-in. screens can be directed for return to a 6-in. Traylor reduction gyratory crusher. This is driven by a 50-hp. English Electric Company motor at 580 r.p.m. The product from this Traylor passes over a 6-ft. by 2-ft. vibratory screen, and anything over ¾-in. or ½-in. (as may be selected by altering the wire cloth) discharges into a 30-in. by 16-in. set of smooth-faced rolls for further reduction. The product of both the latter reducers passes onto an 18-in. return conveyor, returns back to the main elevator, and joins the main stream of stone for screening.

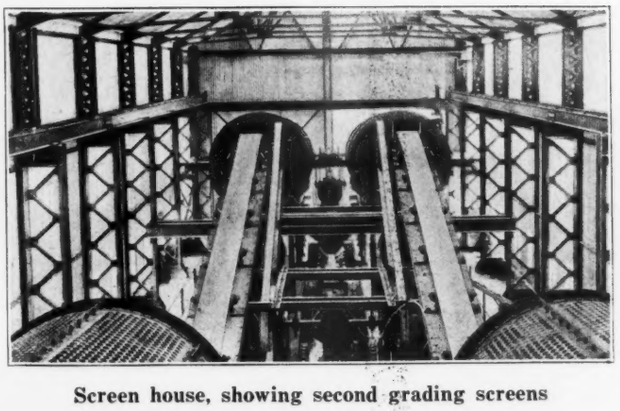
At all points of discharge through the screening and final reducing side of the plant, i.e., the main bin house, the chutes are completely covered, and a powerful suction fan driven by a 15-hp. English Electric Company motor, sucks out flour dust and sand, and these are collected by three cyclone dust collectors of different capacities, the material being bagged at the foot of the cylcones ready for dispatch by rail or road. A vibrating-bag dust collector has been installed to conserve supplies for marketing, and incidentally to prevent dust nuisance over the countryside. Dust is collected, bagged and sold for agricultural purposes, and also as a filler for asphalt.

Below the storage bins for dried stone runs a motor-driven conveyor belt which discharges into an elevator taking the stone up above the tarmacadam mixing plant. Material discharges here into a hopper and is fed into a preheater for secondary heating. This course is necessary in case there should have been a lapse of a day or two between the preliminary process of drying, screening and storage, and the coating of the stone, and insures all stone being dry and warm when manufactured into tarmacadam. The selection of stone required for making into tarmacadam is controlled by the operator up in the mixing house. Each bin opening is fitted with a rotor feeder, which is operated in each case by a solenoid, the latter being controlled by a master camshaft. The operator in the mixing house inserts whichever camshaft may be required into a box containing electric circuits connected with the various solenoids and, according to the length of time that each cam is in circuit, so the solenoid affected operates on the rotor feeder adjoining, and stone is fed onto the conveyor belt below. Various camshafts are kept, and any predetermined grading of stone from 2½-in. down to 1/16-in. can be drawn in 1-ton batches.



Substation and control tower in quarry

The tarmacadam mixers are of the rotary-cone type, two of 1-ton capacity being in operation. Tar is sprayed onto the stone, during the mixing process, by compressed air. Bitumen, when added to the tar, is also agitated by compressed air. These mixers also make up a matrix, with bitumen only, of which there are several in use in this country. These are fluxed with oil and can be made up hot and laid cold. The capacity of the two 1-ton mixers is 30 tons per hour.



Screen house, showing second grading screens

Road Building in England

Although this is an article on quarrying, a mention of existing road practice in Great Britain would not be out of place. The rapid development of mechanically propelled traffic in the last fifteen years has created a problem that is becoming middle-aged, in fact, in connection with road maintenance, and has given an importance to highway administration which it did not have before. With a few exceptions, the general program up to 1914 and the few preceding years, was to coat the main roads with water-bound granite, and at this time they had been tar-sprayed and chipped for a few years. The income of the road fund derived from the car tax imposed by the Finance Act of 1909, and administered under the Development and Road

Power house and shop (left), primary crusher house (right), and control tower in center of quarry (background)

Funds Act of 1910, was 1¼ million pounds in 1914, and the grants by the Road Board from road funds were given up to 75 per cent of the improvement cost of any road repair. This practice had the effect of encouraging local authorities to always provide for some sort of improvement in the work they were carrying out, as the tarmacadam or grouting or asphalt laying expenses cost them only one-quarter of this improved value, the National Exchequer paying the balance. The Act of 1920, however, imposed higher taxes on cars (£ per hp.) and, with the increased number of cars, the fund has reached an income of £ 23,000,000 per annum. The annual expenditure on roads in this country is about £ 54,000,000 and the road fund, when properly administered, has considerably helped meet this expense. Under Sir Henry Maybury's regime as director-general of roads at the Ministry of Transport, a very business-like administration was carried out, and there is no doubt that, in a few years' time, when the position can be reviewed a little more clearly, it will be seen that the ten years—1918 to 1928—marked an epoch in the history of British roads. More work was carried out during that period than in any decade hitherto.

The variation in work caused by the considerations of traffic, in the matter of slipping (with horses), skidding of cars, overturning, tire wear, and springing of cars, increase in road speed and general comfort, and of course the allaying of dust, have demanded from road surveyors a higher technical knowledge of road engineering. Whereas, in bygone days, it was largely a matter of covering the road with stone, from time to time, thought is now given to camber, super-elevation at corners, and the texture of the road surface. Knowledgeable consideration is also given to the question of subsoil and drainage, and the holding up of the sides of the road to prevent general spreading. In cases where widenings and diversions are carried out, great care is exercised in preserving the aesthetic value of the roads. This was especially noticed by the writer in the case of some fillings, levelings and improvements of roads and gradients carried out in Worcestershire, where very pleasing sweeping lines had been produced in the perspective of the altered road.

Highway engineering having then long since become a specialized profession, we find that the road engineer demands a high standard of quality, and fairly rigid adherence to specification in his choice of roadstone; and, because of this, a great deal more selection is probably necessary in the sorting of stone rock suitable for crushing in England than may be the case in America. There are very few wholly water-bound roads left in this country, the practice being to either lay materials, in the order of their wearing value: (1) water-bound with a good spraying of tar or bitumen, well chipped; (2) dried, rolled, clean stone, grouted with cold emulsified bitumen or hot bitumen; (3) with stone precoated at the quarry with tar or oil-fluxed bitumen; or (4) with aggregates made up into asphaltic compound at high temperature with machinery on the site of roadworks. Tar and pitch grouting here have largely gone out of use, principally, I believe, because the variable weather of this country made it difficult to carry out any job during which the weather was completely dry, and a few showers of rain were enough to completely upset a grouting job.

Concrete roads have not developed as one would have expected them to. This is probably due to the difficulty of closing any road in this country for a period long enough to give the concrete a fair set. The concrete never has time to mature, cracks develop, and moisture gets in the road, and frost in winter, with the danger of a general heaving and break-up. For this reason, I believe, the average surveyors are a little nervous about tackling concrete roads.

It will be noticed in my earlier notes that we crush and sell a stone up to 3-in. in size, the heaviest demand at present still being for 3-in. and 2½-in. stone. I believe there will be a general tendency for smaller sizes to be demanded in years to come—probably 2-in. to 1½-in. maximum—and the works about which you have been reading, at Cranmore, are well provided against this change.

I believe, also, that developments for the next few years will largely be in the direction of the use of a mixture made at the quarry with a coating of specially prepared tar, or oil-fluxed or emulsified bitumen which, a very short time after being laid, will set very firmly and enable the road under repair to be opened for traffic immediately.

The officers of this company are: A. W. Huxtable, general manager of the parent company, Roads Reconstruction, Ltd.; J. P. Handscombe, manager of Mendip Mountain Quarries Company; Major P. C. Richardson, sales manager.

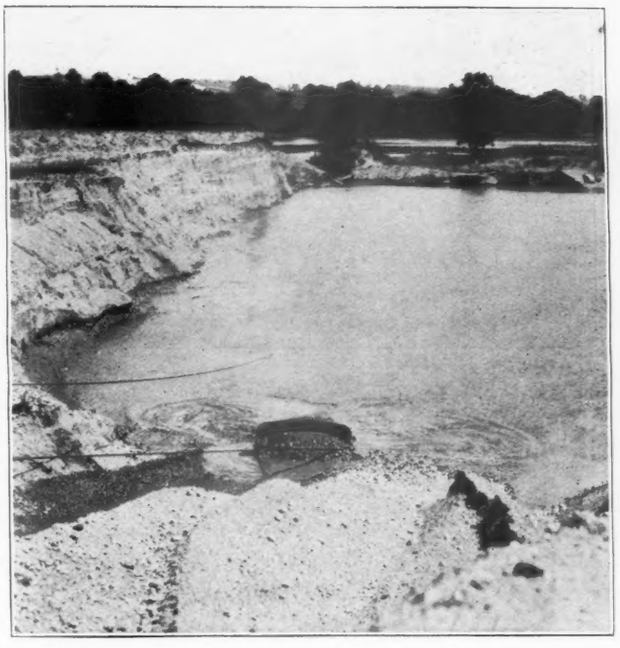
Michigan Gravel Plant's Method of Excavation Changed to Meet Variations in Deposit

Replacement of Steam Shovels by Drag Scraper Required Few Alterations in Plant Design

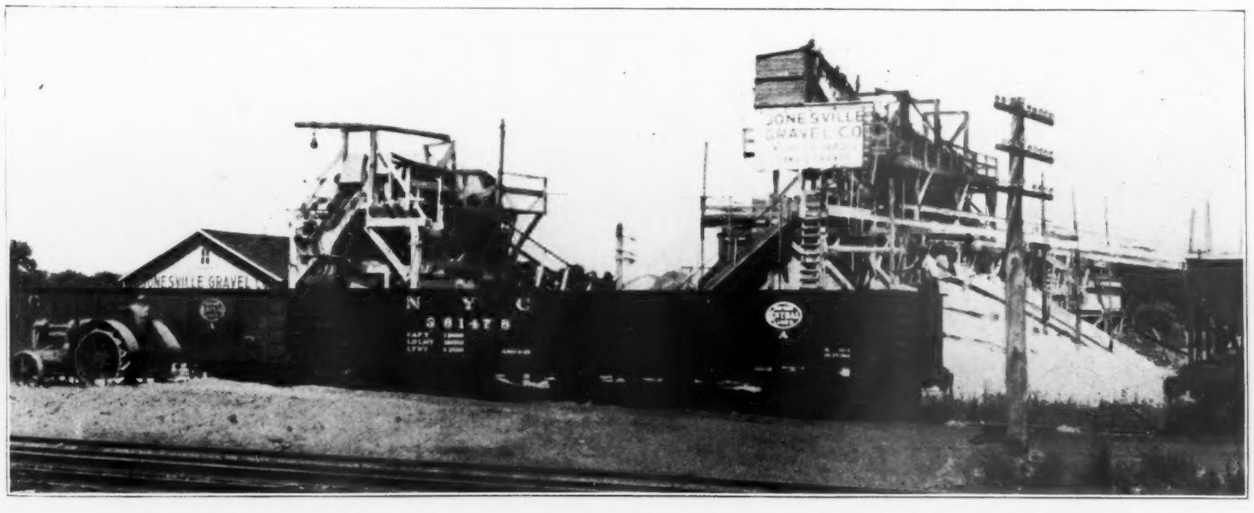
THE sand and gravel operation of the Jonesville Gravel Co. at Jonesville, Mich., has had an interesting history although the plant is not yet four years old. Although originally designed to use steam shovels for excavating the sand and gravel it was found necessary a little over a year ago to install a drag scraper system. The plant, however, has been changed very little, attesting to the soundness of its design.

The plant was built in 1926 and was designed by the Smith Engineering Works. It is located on a 40-acre property one mile south of Jonesville on the St. Joseph river. As stated above steam shovels were originally used for excavating for the first two years of the plant's operation. After this time, however, most of the top 18 to 20 ft. of the deposit, consisting of fine sand and gravel which required little crushing, was exhausted and the water level was reached. A Sauerman cable drag scraper system with a 4-cu. yd. Crescent bucket was then installed for excavating under water. This was used until last winter when it was found that the stone was becoming coarser as the pit became deeper and many large boulders were encountered.

It was then decided to move the operations to a point near the plant where the fine material had not been removed by the shovels. An extra heavy Sauerman bucket of the same size and type as the previous one was then installed. The tail pulley of the scraper system is moved into the bank causing it to cave down into the pit and give a better grading to the excavated material. This method is resulting in material running about 40 per cent sand and 60 per cent gravel. Some of the boulders encountered are of huge size, one recently brought up by the scraper being 7 ft. long, 6 ft. wide and 5 ft. thick. These are mud-capped before being run through the plant. It is also found necessary occasionally to resort to blasting to cave down the bank and dislodge boulders in the pit. The 3 to 4 ft.

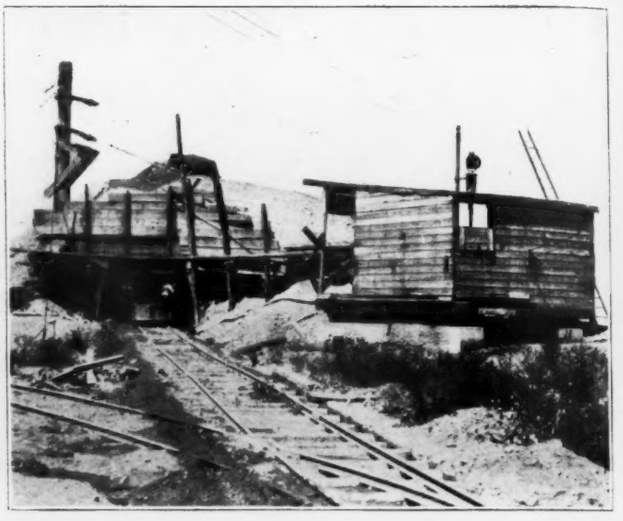


Loaded scraper bucket coming from pit. St. Joseph River in background



General view of plant from southwest. Tractor in foreground moving cars into place for loading

Drag scraper bucket discharging load to cars in tunnel



Train loading under scraper tunnel. Hoist house at right

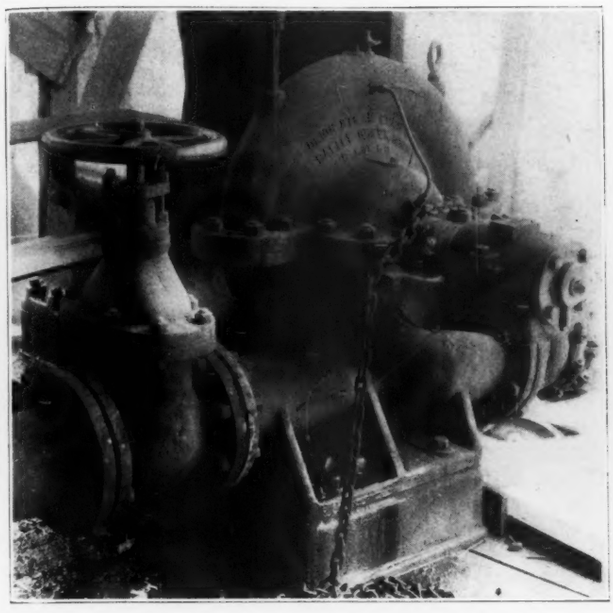
overburden on the deposit is removed by an Erie 1-cu. yd. steam shovel which was formerly used for excavating. It is hauled away to a waste pit and washed into the nearby river by a stream of water furnished by a 4 in. centrifugal pump.

The cable drag scraper has a span of about 600 ft. from the tail to the 30 ft. timber mast. It is operated by a Sauerman 2-drum hoist, silent chain driven by a 150-hp. General Electric motor. The scraper delivers the material to a field bin which discharges through two Webster clamshell gates into 4-cu. yd. Western side dump cars. These are hauled in trains of two by Plymouth 4-ton gasoline locomotives, of which three are owned by the company, and dumped into a concrete track hopper with a 3-in. rail grizzly. Leschen lang lay wire rope is used on the pull line of the scraper and Sauerman Special Excavator on the back line.

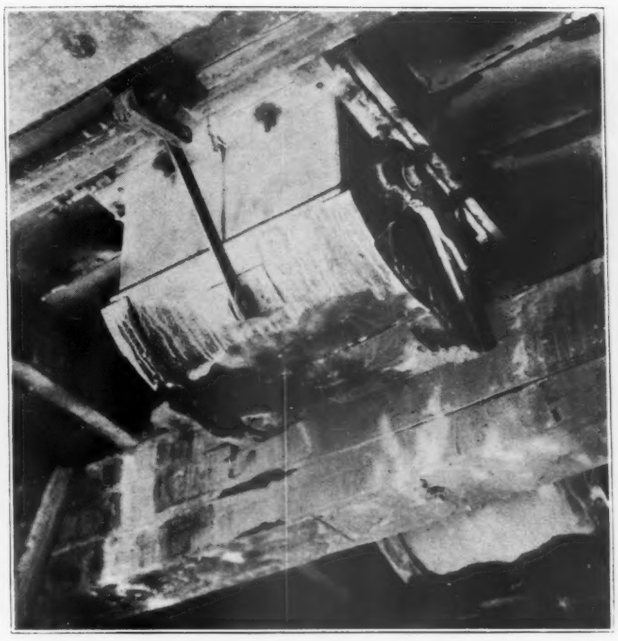
The oversize from the grizzly goes to a Portage Lake Foundry and Machine Co. 18-in. by 24-in. jaw crusher which feeds onto an inclined belt conveyor to the plant. The material passing through the grizzly into the hopper is fed by a Smith plate feeder onto the same conveyor. This is a 24-in. conveyor on 190-ft. centers and is belt and gear driven by a 30-hp. General Electric motor. The feeder is chain driven from the conveyor tail pulley and the crusher is belt driven by a 60-hp. General Electric motor. The conveyor was furnished by the Stephens-Adamson Mfg. Co., and Hewitt Gutta Percha conveyor belting is used.

The conveyor discharges into a wooden wash box where a 6-in. jet of water gives the material a first

General view of plant from south, showing type of open-sided storage bins



One of the centrifugal pumps furnishing wash water for the plant



The clamshell type gates in the scraper tunnel

washing. The material then goes to the Stephens-Adamson 48-in. by 20-ft. revolving sizing screen which has a sand jacket. This divides the material into 4 sizes, ¼ in. and under, ¼ in. to ¾ in., ¾ in. to 1½ in., 1½ in. to 2½ in., the latter 3 sizes going direct to bins. The ¼ in. and under goes to two Telsmith sand settling tanks which separate into fine and coarse sand and discharge directly into their respective bins. The oversize from the screen goes through a chute to a Telsmith No. 32 gyratory reduction crusher. This discharges to a Smith belt bucket elevator which carries the material back into the circuit to the sizing screen. The crusher is driven by a 30-hp. Howell electric motor which also drives the elevator and the screen is driven by the same motor operating the main conveyor through Link-Belt chain. Waste water from the washing operations, the settling tanks and other sources is carried away in two wooden flumes. Any excess of sand can be diverted to a third flume onto a waste pile.

The five main bins are somewhat unusual in design as they are formed by partitions separating them with no side walls. The total storage capacity without rehandling is about 300 tons. A concrete tunnel running under these bins houses a Stephens-

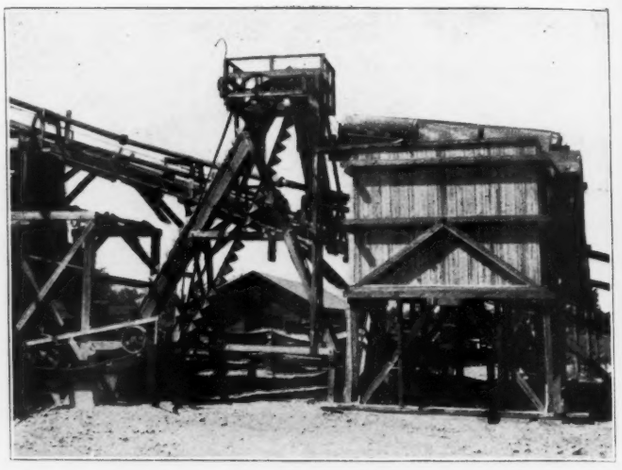
Plant from northeast, with primary crusher and main conveyor to the screening plant at left. Loading conveyor from tunnel under bins in background

Adamson 24-in. loading conveyor on 160-ft. centers which is horizontal under the bins and inclined at the loading end. The discharge from the bins to the conveyor is regulated by Weller clamshell gates. The conveyor discharges through perforated steel chutes into railroad cars on a siding near the plant. The cars are moved into position for loading by a McCormick-Deering 15-30-hp. tractor which is also used for general work about the plant.

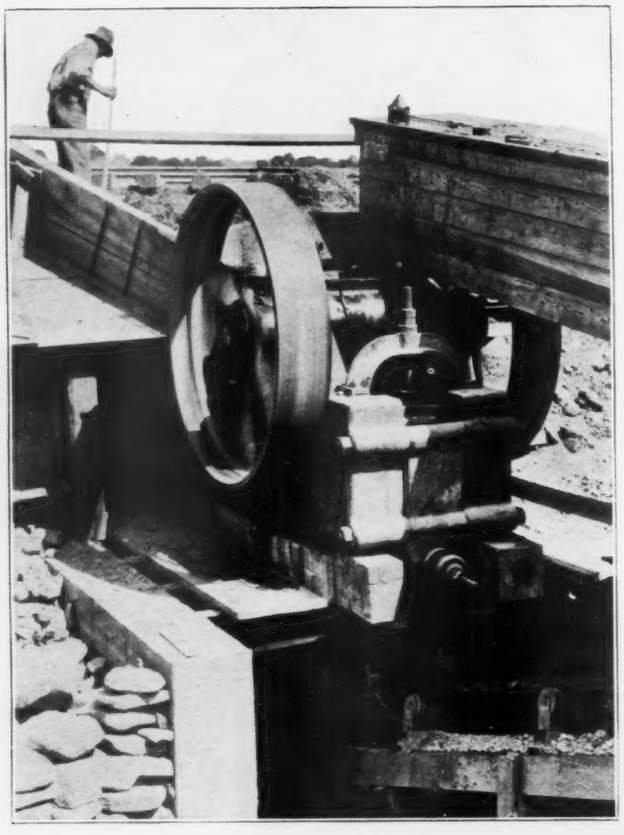
Both the primary and secondary crushers were installed last winter replacing a gyratory crusher which was large enough until the extremely coarse deposit below the water level in the pit was encountered. A change is also being made in the handling of the recrushed material. When this is completed the stone from the secondary crusher will go by elevator to a small revolving screen which will reject all stone over ¾ in. and under ¼ in. back onto the conveyor to the sizing screen. The ¼-in. to ¾-in. stone will go to a bin which will feed a short belt conveyor to the loading conveyor. This material will be used for binder in asphalt pavements. Any size of sand and gravel can also be added to the crushed stone as it goes along the main conveyor.

Water for washing the sand and gravel is obtained from an abandoned pit near the plant. The Union Steam Pump Co. 6-in. centrifugal pump has a length of Victor suction hose on the intake and is driven by a 60-hp. General Electric motor. Two additional pumps of the same make and size are kept in reserve for emergencies. Crane valves and fittings are used. Power is obtained from the wires of the Southern Michigan Light and Power Co. at 33,000 volts and is reduced by an outdoor substation alongside the screening building to 440 volts for all operations.

The plant requires only ten men when in full operation. It has a capacity of about 30 cars in a ten hour day but due to the great demand has been run an average of 12 hours per day all summer. Distribution is over the New York Central Railway

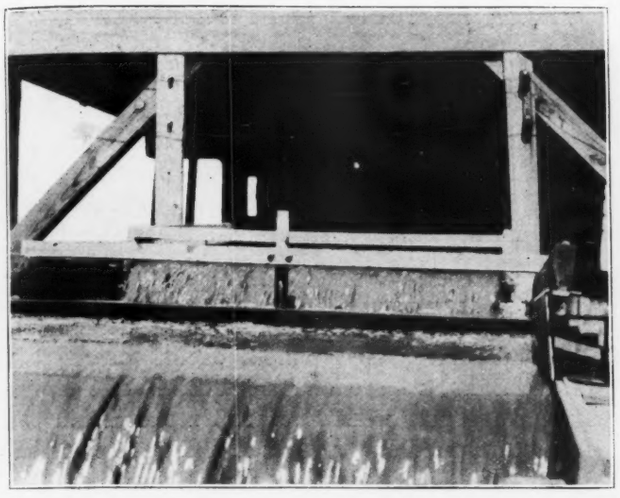


The secondary crusher and elevator feeding to secondary sizing screen



Closeup of primary crusher and feed to main conveyor

Looking at the plant from the top of the loading conveyor

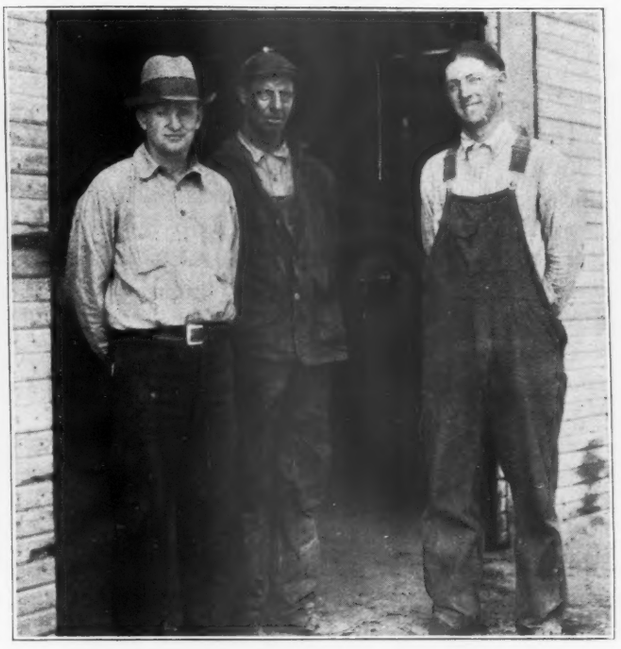


The top of the sand settling tanks

main line between Toledo and Elkhart which runs by the plant. Most of the product is used for road work within a radius of 50 miles of the plant.

A small blacksmith and machine shop takes care of all minor repairs and a complete stock of small parts is kept on hand. A frame office building alongside the machine shop houses the main office of the company and the plant office. Philip Penrod is superintendent of the plant and Fred R. Harriss is president of the company.

Looking down on the main sizing screen, with pit and stripping shovel in background



Superintendent Philip Penrod, at left, with two of his able assistants

Potash Research Program of Bureau of Mines

An extensive research on the extraction of potash from several minerals has been organized during the past two years by the United States Bureau of Mines. Special attention has been given to Texas polyhalite, Wyoming leucite, and New Jersey greensands as raw sources of potash. This work, which is being conducted at the Bureau's Non-metallic Minerals Experiment Station in cooperation with Rutgers University, New Brunswick, N. J., has indicated three economically feasible processes for the extraction of potash from polyhalite.

Details of the polyhalite work will be published in the near future. With regard to greensands and leucite, detailed economic surveys and analyses have been made of the various proposed processes, and a limited number of the latter have been selected as desirable subjects for laboratory investigations.

The potash research organization is essentially as follows: First—The mining section, which has done the core drilling in Texas and co-operated with the U. S. Geological Survey in estimating the character and extent of the potash deposits. Second—The economic and statistical section, which conducts economic analyses of proposed processes. Third—The chemical research division, which investigates the fundamentals of the chemistry involved in any process. Fourth—The chemical engineering laboratory, which tests the more favorable processes on a semi-commercial scale.

Preparing Tru-Mix Concrete

(*Continued from page* 50)

16-hp. electric motor which delivers it to a truck. The 1-cu. yd. mixer is a 28S Koehring with a capacity of 40 cu. yd. of mixed concrete per hr. It is driven by a 20-hp. motor and dumps into an electric hoist which raises the mixed concrete and dumps it into a waiting truck. The 2-cu. yd. and the 1-cu. yd. mixers are entirely independent of one another and may be operated singly or together as desired.

The cement for this plant is unloaded by hand upon the mixing floor or goes directly to the mixers. The required quantity of cement is dumped from sacks into a cement buggy which is wheeled and dumped into the mixer. The measurement of the cement by sacks practiced at all the "Tru-Mix" plants is believed to be more accurate than its measurement by weighing on a combination scale. The measurement of cement is considered inaccurate unless weighed upon a separate, suitable scale.

"Tru-Mix" plant No. 3, also known as the Latona plant, is likewise located on Lake Union, but at Latona St. and Northlake Ave., Seattle. Sand and gravel are received in scows as at the other "Tru-Mix" plants, but here they are unloaded by means of a gantry crane equipped with a 2½-cu. yd. bucket and mounted on top of the bins which have a capacity of about 120 cu. yd. It is an all-gravity plant like No. 1, but it employs a 1-cu. yd. 28S Koehring mixer run by a 20-hp. motor. Thus No. 1 and No. 3 plants may be looked upon as standard "Tru-Mix" plants. It is planned to convert No. 2 to this standard type.

Artificial Abrasives

Artificial abrasives fall chiefly into three main groups, according to the United States Bureau of Mines, Department of Commerce. These are: Metallic abrasives such as crushed steel, steel shot, and steel wool; silicon carbide abrasives such as carborundum, crystolon, and carbolon; aluminum oxide abrasives such as alundum, aloxite, exolon, and lionite. The metallic abrasives are used chiefly in loose form as cutting agents in sawing or drilling rock and other hard materials. A very important use of the silicon carbide and the aluminum oxide abrasives is in the manufacture of bonded abrasive wheels. The abrasive grains graded into uniform sizes are bonded together into wheels of varying degrees of coarseness and hardness. A fusible clay is used as the bonding material in vitrified grinding wheels. Sodium silicate, shellac, and bakelite are also employed as bonding materials. Much progress has been made in recent years in the development of highly efficient abrasive wheels; they are being used more and more as substitutes for natural abrasive products such as emery wheels, grindstones, and pulpstones.

Black Diamond Is Hardest Known Substance

Abrasive diamonds, or industrial diamonds as they are commonly called, are of two types—the black diamond, or carbonado, and bort, says Dr. Oliver Bowles in a report recently issued by the United States Bureau of Mines. The black diamond is the hardest known substance, the claim being made that it is 3 per cent harder than the gem diamond. It is lacking in cleavage, is opaque, and resembles a piece of lava or coal. Black diamonds are found chiefly and almost exclusively in the State of Bahia in the interior of Brazil. The second variety, or bort, consists of cull stones from the gem-diamond industry. Most of these are obtained from South Africa. Unlike the black diamond, bort has a distinct cleavage. Although the diamond is extremely hard it is also brittle and is easily shattered if subjected to a sudden shock or blow.

The chief use of industrial diamonds is in the manufacture of drill bits for rock drilling and boring. The diamonds are set in the lower edge of a hollow cylinder of soft annealed steel. By rotation the bit cuts out a cylindrical core of rock. Black diamonds are used chiefly for this purpose. The chief use of bort is in the manufacture of tools for truing abrasive wheels and in the manufacture of cutting tools which are used for turning hard rubber, ebonite, vulcanite, fiber, metals and alloys, mica, and other materials that dull other tools quickly. Diamond tools are of special value for the production of a large number of pieces of exact and uniform sizes. Perforated diamonds are used as dies for drawing fine wire of accurate and uniform cross section. Diamond saws up to 10 feet in diameter are used widely for sawing rock, such as marble or granite. The diamonds are mounted in detachable steel sockets inserted at regular intervals around the rim. Small diamonds are used extensively as glass cutters. Fragments of bort are pulverized to form diamond dust which is used for cutting and polishing precious stones, as an abrasive in drilling diamonds to make diamond dies, and in sawing procelain and similar hard materials.

No abrasive diamonds are produced in the United States. Import figures for the past several years show a decrease in value of bort and dust, materials which are used chiefly for grinding and polishing, but a marked increase in the value of uncut diamonds used by glaziers, engravers, and miners. Much progress has been made in the manufacture of synthetic abrasive products which are substituted for diamonds in some fields of application. The fact that diamond importations can steadily increase, even when faced with the growing competition of synthetic abrasives, is an indication of the rapidly increasing use of abrasive materials in industry.

Lime and Cement from Gypsum With Recovery of By-Products*

By OTTO F. HONUS

[*As commercial development increases and the ramifications of industry and finance become more and more complicated, resulting in combinations of enterprises which can and do render better service because of the possibilities of more efficient and economical operation, competition becomes more severe. The result is that manufacturers are confronted with the necessity of reducing costs so that they can sell their products at lower prices and still make a suitable profit. There are a number of ways in which this can be done, or at least wherein an attempt can be made to do so, but there is scarcely any question that the most desirable one is that which allows the manufacturer to recover valuable by-products, enjoying a ready market, from his manufacturing operations.*

The cement industry has had to face changed economic conditions just like any other industry in the country. It has been forced to look closely into the question of costs. It has had presented to it the possibility of recovering by-products, particularly when gypsum is used as the raw material in the manufacture of cement. The sulphur that is contained in the gypsum represents a source of such by-products, and a highly important one at that. The market for sulphur products, that is sulphuric acid and the like, has been a very favorable one all throughout this year and the indications are that it will continue to be favorable and the acid and sulphates in greater demand, for the new industries, such as the rayon industry, which use these products in their manufacturing operations, are all set for increased production in 1930.

It has therefore been thought advisable to publish the following article which is in the nature of a patent review on processes concerned with the manufacture of lime and cement from gypsum with consideration of the possible uses of the by-products that can be recovered during this process. These patents are all of German origin and afford many ideas and suggestions to those who are interested in this particular subject. Trans.]

THE idea of recovering by-products from gypsum with the simultaneous manufacture of a hydraulic cement is an old one. Nevertheless, it is only within recent years that the technical and scientific work of cement technologists have made it possible to produce a good grade of lime or cement along with a sufficiently concentrated sulphur dioxide gas (between 5 and 7 per cent by volume) that could be worked up into sulphuric acid. O. F. Kawelitz (see *Zeitschrift fuer angewandte Chemie,* volume 33, pages 49ff) described a process for the utilization of the sulphur in gypsum, in which the latter is reduced to calcium sulphide and the hydrogen sulphide is burnt to elementary sulphur. Thus anhydrite is broken up into small pieces and dried, and then mixed with dry coal. The mixture is then heated continuously in a rotary kiln at a temperature of approximately 1,100 deg. C. The sulphide of calcium thus obtained is ground and decomposed by means of steam. The sulphuretted hydrogen gas evolved is collected in holders, from which it is drawn into a mixing installation, wherein the required amount of air for combustion of the gas is blown in. The mixed gases are burned without flame in contact ovens with the result that sulphuretted hydrogen combines with oxygen to give water and sulphur in precipitate form. The precipitated sulphur is drawn off in liquid state and allowed to congeal in cooling cans in a cooler. It is very pure, containing 99.95 per cent of sulphur on the average. Lime is obtained as the residue.

According to German Patent No. 307,772 of October 20, 1917 (Chemische Fabriken vormals Weiler-ter-Meer, Uerdingena, Rhein, Germany), calcium sulphide (CaS) is allowed to act on calcium sulphate at a temperature in excess of 1000 deg. C., with the result that the following double decomposition takes place: $3CaSO_4 + CaS = 4CaO + 4SO_2$. For example, a mixture of 87.8 per cent of gypsum and 12.2 per cent of calcium sulphide or 85 per cent of anhydrite and 15 per cent of calcium sulphide is heated to 1,050 to 1,150 deg. C. The evolution of sulphur-dioxide gas increases in measure as the temperature rises and the evolution of gas lasts until almost all of the sulphur in the form of sulphate and sulphide has been driven out. The residue is pure lime.

According to German patents No. 307,043, 343,694, 349,346, 349,347, and 371,863, which have been assigned to the Metallbank und Metallurgischen Gesellschaft, located at Frankfurt on Main, Germany, sulphurous acid can be obtained along with lime treating a mixture of calcium sulphate and carbon, or a mixture of an alkaline earth sulphide and sulphate, whose sulphur-evolving sintering agents, such as silica and artificial or natural substances, which contain silica, such as sand, clinker, ashes from furnaces and the like, are added in such proportions, along with iron oxide and substances, that contain iron oxide, that they can be

* *Zement,* 1929, 1130-35

decomposed due to the excess heat of combustion evolved in the combustion of calcium sulphide. One of these processes recommends that the pulverized mixture of calcium sulphide together with the sintering material should be converted into the granular form or into the form of larger pieces or balls. Burnt gypsum is used as the binding agent. The percentage of sulphur dioxide in the gas amounts to from four to six per cent. The gas does not contain carbon monoxide, and the remainder of the gas consists of carbon dioxide, nitrogen and a little sulphur trioxide.

Bruno Weser, in German Patent No. 400,422 of February 24, 1923, found, in testing out the practicability of the last-mentioned process, that decomposition can be effected much more easily when the gypsum is not caused to react with the sulphide, but when it is preliminarily mixed with an aqueous solution of the sulphydrate. A homogeneous mixture can be prepared without any difficulty or preliminary treatment from the insoluble sulphate and the soluble sulphydrate, with the result that the process is materially improved from the mechanical standpoint. A very pure grade of lime is obtained when gypsum is being treated in this manner, even at temperatures which fall between the limits of 900 and 1,000 deg. C. The entire quantity of sulphur dioxide is also split off. The reaction probably takes place in accordance with the following equation: $Ca(SH)_2 + 6CaSO_4 = 7CaO + 8SO_2 + H_2O$.

The purpose of the processes which have been patented in German Patent No. 392,280 and No. 413,376 of August 27, 1920 by the Aktiengesellschaft fuer Anilin-Fabrikation, Berlin-Treptow, Germany, the inventor, Dr. A. Bibergeil, and Dr. S. Muench is to obtain pure alkaline earth oxides along with sulphur and/or sulphur oxides. The feature of the process is that calcium sulphate, magnesium sulphate, barium sulphate or strontium sulphate is treated in rapid alternation with reducing and oxidizing agents. In the case of magnesium sulphate the decomposition begins at a temperature of approximately 900 deg. C., while the reaction in the case of barium sulphate and strontium sulphate sets in only when the temperature is raised above 1,000 deg. C.

German Patent No. 432,099, which was filed earlier than these patents but which was published later (the application date was February 21, 1914), and which was taken out by Dr. Bambach & Co., Chemische Gesellschaft mit beschrankten Handlung, Frankfort on Main, Germany, describes a process which has the same purpose as those patents described in the previous paragraph. It has, however, essential advantages over the known processes, for it can be carried out by purely thermal means without the addition of reagents. In this case the inventor made use of two well-known facts which were used in combination form. One of these was the chemical decomposition of calcium sulphate at a temperature of approximately 1,400 deg. C., which has been studied by H. O. Hoffmann and W. Mossowitsch and described by them in their article in the Bulletin of the American Institute of Mining Engineers, 1910, pages 917 and 1909, pages 219ff. The other is concerned with the discovery of flameless surface combustion. This is a new form of technical heating whose bases were simultaneously and independently formulated by R. Schnabel in Germany, Prof. Bone in England and Prof. Lucke in the United States. When the air or rather the oxygen of the air is entirely or partly removed in an intermittent process from the reaction mass in the decomposition process effected in a furnace burning gas, then sulphides are formed during that period wherein the air is withdrawn. These sulphides are again decomposed to form oxides and sulphur dioxide gas when the admission of oxygen again takes place. The reactions that take place are in accordance with the following equations: $CaSO_4 + 4CO = CaS + 4CO_2$. $CaS + 30 = CaO + SO_2$. In this case the sulphate is first heated, and during this stage of the process gas is admitted which only allows flameless combustion to take place. After reduction has been completed, air is finally admitted, with the result that the sulphide that has been formed in the first stage of the process is decomposed into oxide and sulphur dioxide. When the process is skillfully carried out, gypsum (which contains water) as well as anhydrite, can be converted into calcium oxide of sufficient purity and highly concentrated sulphur dioxide gas.

Van Denberg (see United States Patent No. 642,390) obtained sulphur trioxide as well as lime by the electrolysis of anhydrite in the molten state in the presence of excess air. The sulphur trioxide that was obtained in this manner is hydrated to form sulphuric acid.

The German Petroleum A. G., Berlin, Germany, owns a patent (German Patent No. 319,651 of August 7, 1918) in which it was proposed to cause gypsum or anhydrite to react with methane at temperatures between 800 and 1,300 deg. C for the purpose of obtaining calcium sulphide. The reaction takes place in accordance with the following equation: $CaSO_4 + CH_4 = CaS + CO_2 + 2H_2O$. The speed of the reaction depends on the pressure of the gas methane as well as on the temperature, and the temperature again depends upon the speed with which the methane gas is conducted into the reaction mixture. When the temperature rises in excess of 1,300 deg. C., then the reaction takes place in accordance with the following equation: $CaSO_4 + 2CH_4 = CaS + 2C + 4H_2O$. Carbon is separated. The methane gas

is again allowed to pass over the finely pulverized calcium sulphate or the sulphate is moved in countercurrent to the flow of gas in rotary drums.

These experiences do not agree very well with the investigations which were made by E. H. Riesenfeld and M. Hesse (see *Journal fuer prakt. Chemie*, year 1920, volume 100, pages 115, 116, 135, 142, 146, 154 and 157). These investigators found from a series of experiments that the quantitative reduction of calcium sulphate by methane to calcium sulphide at temperatures between 800 and 1,000 deg. C. is possible only when the time of reaction is sufficiently prolonged. The investigators also found that even at a temperature of 1,100 deg. C. a portion of the calcium sulphide is converted into calcium oxide, while the equivalent quantity of sulphur is evolved in gaseous condition. When the temperature is increased to over 1,200 deg. C., carbon is simultaneously deposited, which is apparently due to the decomposition of the methane gas which is passed through the reacting mass. The sulphur is more completely driven out of the reacting mass, the greater the excess of water vapor. The four following reactions take place in the presence of each other when steam and methane are allowed to act simultaneously on calcium sulphate at temperatures in excess of 1,000 deg. C.

$$CaSO_4 + CH_4 = CaS + CO_2 + 2H_2O.$$
$$CaSO_4 + CH_4 = CaO + CO_2 + H_2S + H_2O.$$
$$CaSO_4 + CH_4 = CaO + CO_2 + S + H_2O + H_2.$$
$$CaSO_4 + CH_4 + H_2O = CaO + CO_2 + SO_2 + 3H_2O.$$

Riesenfeld and A. Faber (see *Journal fuer prakt. Chemie*, year 1920, volume 100) investigated the reduction of kieserite with carbon. It was found that the most favorable temperature for this purpose was between 850 and 950 degrees C. and that the most advantageous mixture was one consisting of magnesium sulphate and coal in the molecular ratio of 1:1 and 1:1.5. Under these conditions magnesium sulphate is quantitatively reduced from a technical standpoint to magnesium oxide, whereby approximately 98 per cent of the sulphur is evolved in the form of gaseous sulphur dioxide.

Tilghmann (see *Dingler's polyt. Journal*, volume 106, pages 196ff, year 1847) proposed to lead steam over incandescent gypsum, with the result that lime, sulphur dioxide, oxygen and a certain amount of sulphur trioxide were formed.

The investigations that were carried out by Budnikoff and Wosnessensky in this connection showed that only a slight reaction set in at a temperature of 1,000 degrees C. They detected only a small quantity of lime (3.9 per cent) in the decomposition products. Water apparently exerts no change on the products obtained from the splitting of calcium sulphate in the absence of carbon or silicates. Riesenfeld made a thorough investigation of the action of steam on a mixture of gypsum and coal and established the fact that from 23.6 to 41.8 per cent of sulphur dioxide, 69.3 to 57.4 per cent of sulphur and 7.1 to 0.8 per cent of sulphuretted hydrogen were formed at a temperature of 1,200 to 1,300 deg. C. depending on the quantity of steam used. A process for decomposing gypsum, preferably in an atmosphere of oxidizing agents, is described in Czechoslovakian patent application number 4,832/25, dated October 5, 1925 (Rhenania Verein chem. Fabriken A. G., Koeln, Germany). The gypsum is treated in admixture with silica or substances containing silica at a temperature of 1,100 degrees C. or at higher temperatures with steam. Sulphuric acid and hydraulic lime are obtained.

The processes, which have been briefly reviewed, are mainly concerned with the production of pure alkali earth oxides, particularly lime or lime in combination with silica in the form of strongly hydraulic lime products and sulphur compounds. The processes which are described below are concerned with the manufacture of cement along with the recovery of sulphurous acid.

A process which could not attain commercial importance was patented by Cummings in United States Patent No. 342,785 and in British Patent 7,355/1886 by Lacke. According to these inventors, a mixture of gypsum and clay was calcined in a shaft kiln, with the formation of a hydraulic cement, while sulphur trioxide and sulphur dioxide were driven off and converted into sulphuric acid by the usual methods. This process was tested and the cement obtained was found to be usable, but the manufacture of sulphuric acid from the highly diluted gases was not practical, according to the described methods.

German Patents No. 300,849 and 388,849, taken out in the year 1919 by F. Bayer & Co., Leverkusen, Germany, are particularly noteworthy. A mixture of gypsum with silica and siliceous alumina and less than the theoretically necessary amount of carbon is burned, according to these patents, in an ordinary rotary kiln 50 meters long and 2.5 meters diameter, at a temperature of 1,450 deg. C. The mixture is burned to sintering while a weakly oxidizing current of air is passed through. The conditions, which must be maintained in order to obtain a good grade of cement and a pure, sufficiently concentrated sulphur dioxide gas (six to seven per cent by volume) for the manufacture of sulphuric acid by the lead chamber and also by the contact process, are as follows:

In the first place the kiln must be charged with a mixture that is as finely ground and as dry as possible. The gas that is introduced into the kiln must be weakly oxidizing, for, when the atmosphere within the kiln is reducing, carbonyl sulphide (COS) is formed in the gas and calcium

sulphide (CaS) appears in the clinker. The carbon content of the mixture, corresponding to the equation, $CaSO_4 + C = CaO + SO_2 + O$, is unfavorable for properly regulated burning, for, under these conditions, too strong a reducing effect is engendered and the resulting calcium sulphide causes the mixture to melt instead of to sinter. When the cement mass is melted in the kiln, the feared formation of deposits on the wall of the kiln takes place. In order to avoid this difficulty, it is necessary to add only half of the theoretically required proportion of carbon. Only enough carbon should be added to effect the reaction according to the following equation: $2CaSO_4 + C = 2CaO + 2SO_2 + CO_2$. A small excess of oxygen should also be present. When these conditions are maintained, the operation of the kiln will be satisfactory from the standpoints of the burning of the clinker and of the concentration, as well as the purity of the sulphur dioxide gas.

Coke is used as the reducing agent; it is added to the raw mixture in the form of fine pulverized and dust-dry powder. The chemical composition of the product corresponds to that of a normal portland cement with a hydraulic modulus of 2 and a silicate modulus of 2. The cement obtained in this manner attains a compressive strength of 417 kilograms per square centimeter after six days storage under water, of 513 kilograms per square centimeter after 27 days storage, and of 606 kilograms per square centimeter after 27 days of combined storage. The portland cement is worked up to a blast furnace slag cement by mixing it with slag in the proportion of 30:70. The product sets within five to eight hours and gives a very good compressive strength, not less than 406 and up to a maximum of 565 kilograms per square centimeter after 27 days of combined storage.

According to the process developed by L. P. Basset of France, patented in German Patent No. 324,570, year 1912 and German Patent No. 339,-174, year 1914, hydraulic lime or cement is obtained in the following manner: An intimate mixture of gypsum, clay and coal is introduced into a rotary kiln either in the dry form or as a mud. Two burning zones are advantageously maintained in the kiln, one a reducing incandescent zone, in which an excess of calcium sulphide is formed, and the other, an oxidizing zone to accomplish the complete decomposition by oxidation of the calcium sulphide previously formed. It is recommended that steam should be conducted through the heated mixture in order to make sure that decomposition is as complete as possible. In order to obtain cement, gypsum is first heated alone with an excess of clay, with the result that the intermediary product is decomposed by the remaining limestone, which is used in amount theoretically equal to the quality of cement it is desired to produce. The mixture is then buried again.

According to Italian Patent No. 413,166 (Natho), finely pulverized calcined gypsum and clay are mixed together in such a proportion that the ratio of the combined silica, plus alumina, plus iron oxide to lime is between 0.43 and 0.50. The mixture is formed into bricks by the addition of a little water, which are then heated in the kiln in such a manner that the carbon does not come into direct contact with the mass. Provision is made for the addition of a large amount of air. Calcium silicate (CaSiO) is formed at a temperature of 1,000 deg. C., at 1,450 deg. C. $CaO + SO_3$, and at 1,600 deg. C. $Ca_5Si_2O_9$. Calcium aluminate and calcium ferrite are formed at the same time and the clinker that is obtained in this manner resembles closely ordinary portland cement clinker. The gases that are evolved from the kiln at a temperature of 500 deg. C. are use for the dehydration of gypsum at a temperature of 155 deg. C., before they enter the sulphuric acid manufacturing apparatus.

(*Concluded in next issue*)

Self-Unloading Sand Boat on Lake Constance

A new type of vessel equipped for self-unloading of its cargoes has been in service on Lake Constance, Switzerland, long enough to show its practicability, and others of the type will undoubtedly be built. The hull, built by the firm of Buss, S. A., of Basle, is 30 m. (98.4 ft.) long, 7.5 m. (24.6 ft.) wide at the deck, and 1.85 m. (6.07 ft.) deep. It has a loading capacity of 115 m^3, or 153 cu. yd., and is driven by a 75-hp. Diesel-Sulzer engine. It is used for carrying sand and gravel.

The self-unloading equipment, permitting one man to unload 40 m^3 or 53 cu. yd. per hour, consists of two screw conveyors in the bottom of the hull, discharging to a chain-bucket elevator amidships, which in turn discharges by means of a spout from the head of the elevator to belt conveyor 20 m. (65.6 ft.) long, by which the material is unloaded on the bank. These machines were supplied by Daverio & Cie., S. A., of Zurich, and are driven by electric motors fed with current by a small generator. The belt conveyor is raised and lowered and swung by means of a hand winch. —*Technique Moderne* (Paris) 21:701-2, Nov. 1, 1929, credited to *Revue Brown-Boveri*, Aug. 1929.

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Franklin, Tenn.

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.

A. C. Wilby

Assistant to President,
Universal Atlas Cement Company
Chicago, Illinois

NEW CORPORATIONS

Rochester Sand & Cut Stone Corp., James Vincelli, 116 Exchange Place Bldg., Rochester, N. Y. $10,000. Carl P. Campbell. To produce sand.

Hinman Pure Lime Co., Frank Hinman, Jerome, Ariz. $100,000. F. H. Lyons.

Yuma Sand & Gravel Co., H. L. Gardner, Yuma, Ariz. $50,000. E. L. Simpkins, C. H. Trigg.

Midwest Gravel Co., L. A. Briggs, Pres.-Gen. Mgr., Appleton, Minn. $30,000. (Successors to Appleton Transfer & Ice Co. and Minn. Pipe & Tile Co. at Appleton, Minn.) To produce washed sand and gravel. P. L. Briggs, Vice-Pres.; Mrs. L. A. Briggs, Sec.-Treas.; A. B. Chamberlin, Plant Supt.

Eastern Sand & Gravel Co., 1508 Widener Bldg., Philadelphia, Pa. $5,000.

Nueces River Sand & Gravel Co., J. E. Garrett, Corpus Christi, Tex. $5,000. L. H. Gage, William McKennon. Gravel pit at Mathis, Texas.

McLean Stone Co., Newsom Station, Kingston Springs P. O., Tenn. $300,000. Ralph E., Morris E. McLean, J. G. Stephenson. Bought rock quarry of Big Harpeth Quarries, Inc.

General Quarry Co., M. H. Goldsmith, 507 Oakland St., Austin, Tex. $25,000. H. J. Wilson, San Antonio; G. J. Ditmar, Austin.

Lithgo Sand, Gravel & Construction Corp., P. A. Reiser, Poughkeepsie, N. Y. $50,000.

Lake County Sand & Gravel Co., A. C. Knight, Township Hall, Willoughby, Ohio. 250 shares n. p. v.

Long Stone Co., Amos Long, Columbus, Ohio. $20,000. V. Heil, L. V. Balmer.

Millmont Quarry Co., Millmont, Reading P. O., Pa. $20,000. Walter R. Hollinger, Treas., City Hall, Reading; Jacob L. Miller, 616 N. Ninth St., Reading; Irvin F. Weber, care Weber Electric Co., Reading.

McLanahan-Watkins Co., Inc., Joel H. Watkins, Pres.-Mgr., Charlotte C. H., Va. $15,000. Thomas Rutherford, Vice-Pres., Sec., Treas. To mine and mill cyanite for use in manufacture of super-refractories and porcelain electrical supplies. Mine and mill near Charlotte C. H. Shipping point, Cullen, Va.

Quapaw Indian Chat Co., G. W. Rice, Sec.-Treas., Gen. Mgr., Mining Exchange Bldg., Miami, Okla. $9,000. F. E. Spencer, Vice-Pres. Plant at Quapaw, Okla.

North Kenova Development Co., John T. McClintock, Pres., Huntington, W. Va. $75,000. To develop 700-acre tract in Lawrence County, Ohio, opposite Huntington, W. Va. C. J. Rau, Vice-Pres.; Dolla D. Campbell, Sec.; W. L. Ingerick, Treas. Gravel pit will be developed along the river bank and it is planned to mine salt, bromine and by-products, and quarry building stone.

Bushnell Basin Sand & Gravel Corp., R. T. Gallagher, Rochester, N. Y. $50,000.

Morris County Sand & Gravel Co., Bloomfield, N. J. $250,000 pfd.; 25,000 shares com.

Medina Sandstone Corp., Albion, N. Y. 200 shares com.

Canadian Flint & Spar Co., Ltd., Norman B. Davis, Mgr., Buckingham, Que., Can. Organized by M. J. O'Brien, Ltd., and associates, Ottawa, Ont. Will erect mill for grinding feldspar, flint, and quartz. Feldspar to be ground will come from O'Brien mines.

Coloring and Hardening Process for Iron Slag Bricks

An important forward step in the manufacture of building materials has been taken by Adam Sassur, Chicago, Ill., who has applied for a patent upon a process for brick manufacturing that requires no burning, and uses slag from iron furnaces as raw material. He describes his process as follows:

Iron slag, granulated by water-cooling, is received in dumping cars from the steel mills, is unloaded by conveyors, and put into storage or into the plant. The slag must pass through a screen of ¼-in. to ½-in. mesh, as occasionally small lumps of iron and stones are mixed with it.

The screened slag goes into a hopper which holds about 15,000 lb. From the hopper, by opening a sliding door, it goes into a drum-mixer. To this is added 2 per cent to 3 per cent lime, 2 per cent to 2½ per cent calcium sulphate (gypsum), and 3 per cent to 5 per cent magnesian limestone which contains 50 per cent $CaCo_3$ and 50 per cent $MgCo_3$. The drum-mixer is then closed tightly.

A 1½-in. to 2-in. steam pipe leads into the mixer to heat the material, especially during cold weather. It is best that the material be warm when it is pressed into bricks. If the material is too dry, water must be added, as the moisture required is 10 per cent to 12 per cent. The contents of the mixer must be mixed for 15 or 20 minutes, after which the drum is opened and the material dumped into a hopper which holds 30,000 to 35,000 lb.

In the lower part of the hopper is a rotating table. Level with the table and at one side is an opening, 12-in. by 16-in., out of which the material drops into a pocket conveyor which carries it into the press-room and dumps it into a dry-pan.

From the dry-pan it slides through chutes to the presses, and is pressed into bricks. The bricks are taken from the presses and piled on flat trucks—about 1,000 bricks on a truck. They are then put into the iron kiln —20,000 to 30,000 bricks in a kiln. The kiln is closed tightly and the bricks are subjected to a steam pressure of 100 to 300 lb. They remain there 8 to 10 hours, and then the steam is withdrawn. It is during this curing process that the calcium sulphate, under the 350 deg. F. temperature, crystallizes simultaneously with the other compounds.

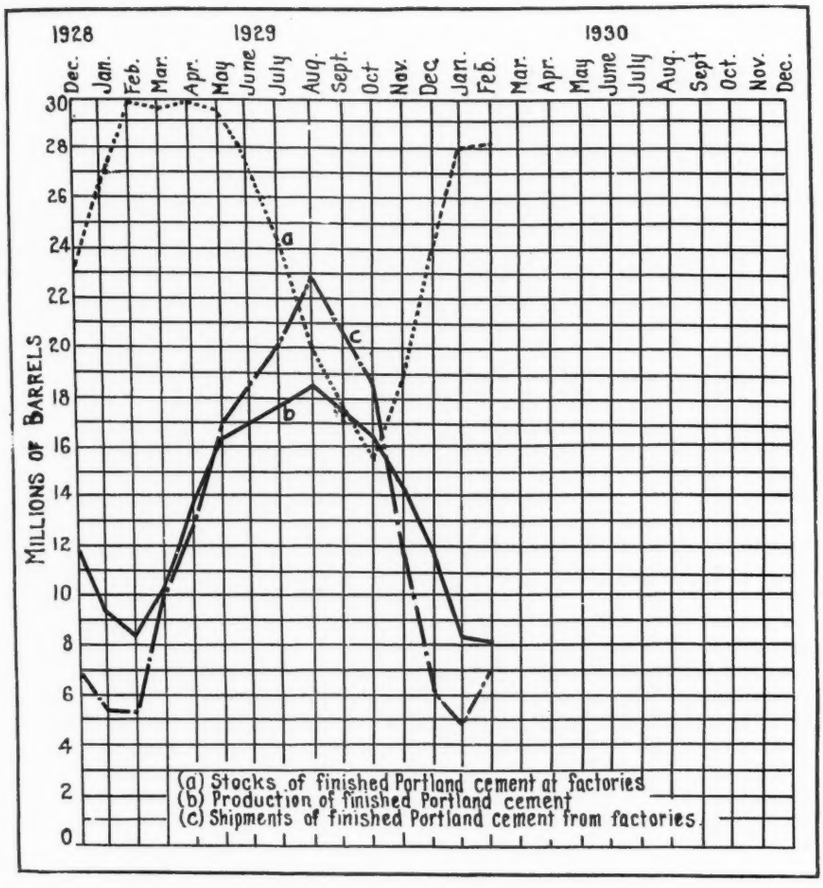
Bricks made under this process were tested one day after their making and the average compressive strength was 4,600 lb. per sq. in., as compared with bricks made with the same slag, 5 per cent lime, and 5 per cent granite, which showed a strength of 3,200 lb. per sq. in.

Bricks made by the above process are a light Bedford in color. To obtain a light-red to dark-red brick, 5 per cent ferruginous quartz (red jasper) and ½ per cent to 2 per cent red iron-oxide are added to the above mixture when it is put into the mixer. To obtain a yellow, 5 per cent ferruginous quartz (yellow jasper) and 1 per cent to 2 per cent siderite (carbonate of iron) are used. For a brown brick, 1 per cent brown limonite and 1 per cent to 1½ per cent ferro-manganese are used. This coloring costs only from $0.30 to $1 for 1,000 bricks, withstands the curing process much better than does a chemical coloring, and the cost is much less.

Bricks manufactured under this process are uniform in color; the edges are straight and sharp; they are highly resistant to acid; they are not so readily attacked by water; they absorb water 50 per cent more slowly than bricks manufactured by other processes; and not one brick out of 100,000 is lost because of imperfect manufacture.

These bricks can be manufactured twelve months of a year, in any climate.

The manufacture of these bricks is clean; there is no dust nor odor; clay pits are unnecessary and any site having rail facilities can be used for a plant. The fuel cost is low, as one ton of soft coal will produce 25,000 bricks in a plant with an output of 100,000 bricks per day. The live steam can be drawn from one kiln into another, as each hardening process is completed.


1928
1929
1930
Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept Oct. Nov. Dec.
MILLIONS OF BARRELS
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
a
b
c
(a) Stocks of finished Portland cement at factories
(b) Production of finished Portland cement
(c) Shipments of finished Portland cement from factories.

Report of Cement for February

American portland cement mills show practically no improvement in the ratio of operations to capacity as indicated by the figures for the 12 months' period ended February 28. According to statistics released by the Bureau of Mines of the Department of Commerce, the ratio of operations to capacity for the last twelve months was 65.6 per cent. The ratio percentage for 12 months' period ended February 28, 1929, was 71.0 per cent.

The ratio percentage was at a maximum of 71.1 per cent for the 12 months' period ended April 30, 1929, and compares with the ratio percentage of 65.6 per cent for the 12 months' period ended February 28, 1930.

During the month 8,162,000 barrels were produced, 7,012,000 barrels were shipped, and stocks on hand at the end of the month were 28,231,000. Production in February 1930 was 4.2 per cent less and shipments 28.7 per cent more than February 1929. Stocks at the mills were 5.5 per cent less than a year ago.

Chimneys and Draft

By W. F. Schaphorst

I am in receipt of a letter containing this inquiry:

"Does the height of a chimney have much to do with the draft under the boiler? I have heard it argued pro and con and I would like to have your opinion.

"Through this part of the state we use stacks of standard height but I notice in south Texas that they use many of them that are not over 30 feet high for, say, a hundred horse power boiler."

Yes, the height of a stack has very much to do with the draft under the boiler. It is the stack that creates the draft. The higher the stack the greater the draft. But the area of the chimney also is a factor that enters and which must be considered.

I have prepared a chart which is useful for determining the number of pounds of coal that may be burned per hour on a given grate, knowing the area of the chimney in square feet and the height of the chimney above the grate in feet.

For example, the dotted line drawn across this chart shows that if the height of the chimney above the grates is 100 feet and the cross-sectional area of the chimney is 45 square feet, 10,000 pounds of coal may be burned per hour on the boiler grates. The chimney will take care of all of the gases.

Any straight line across the chart will solve a problem. Thus, if you know how much coal you want to burn per hour and if you know the height to which you want to build the chimney, a straight line will tell you what the area of the section of the chimney must be. It may be built round or square.

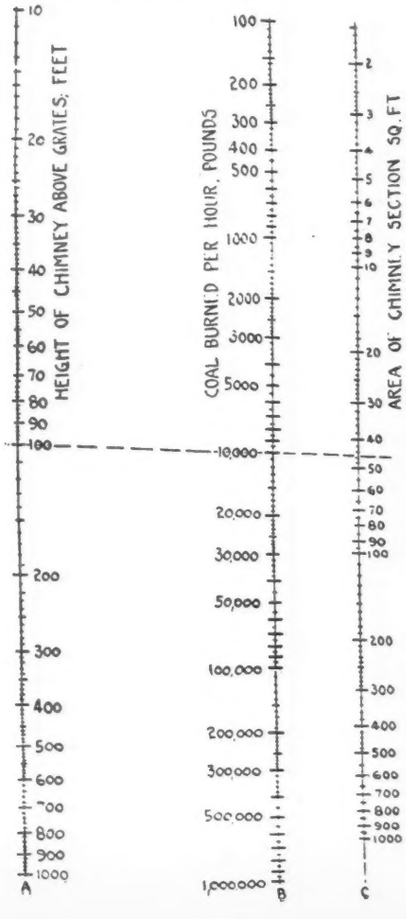
The range of the chart, as will be noted, is great enough to take care of any chimney that has ever been built—from 10 to 1,000 feet in height and in area from 2 square feet to 2,000 square feet. Column B gives the coal burned up to 1,000,000 pounds per hour, which, as every reader will agree, is a considerable amount of coal. 500 tons per hour is burned by some plants.

The chart is based on this well known formula:

$$A = \frac{F}{21.8\sqrt{H}}$$

Where A=the cross-sectional area of the chimney in sq. ft.,
F=number of pounds of coal burned per hour;
H=height of chimney above the grates, in feet.

It is all right to use the formula, to be sure, but the chart will be found much quicker and highly accurate. After a chimney size is roughly decided upon it is a good plan to apply the formula itself, merely to "check up" the chart. There is nothing better than "checking and rechecking" on problems of this kind because large chimneys are naturally costly.



Use of Aquagel in Cement, Mortar and Concrete*

AQUAGEL as supplied to the building trade for incorporation into cement, mortar or concrete is a grayish white powder. It is a silicate material similar in chemical composition to portland cement and forms a jelly-like mass when mixed with 25 times its weight of water. This property and its affinity for cement are probably the reasons for its value in mortar and concrete.

When a paste or slurry is made from cement and water in the proportions usually required in concrete work, that is, with a water-cement ratio of between 0.60 and 1.00, it is noticeable that there is a segregation of the coarse particles of the ground cement clinker from the finer particles. In other words, if cement is thoroughly mixed in a bottle with an equal amount of water, then allowed to stand, black particles of clinker will settle out at the bottom of the bottle and flour-like material will remain at the top. This segregation in the cement paste is a cause of crazing, dusting and hair cracking of cement work. It is also a cause of lowered strength. One of the purposes of Aquagel is to preserve the uniformity of the composition of the cement paste, thus improving strength and eliminating crazing, cracking and dusting. This maintenance of surface integrity and smoothness of finish, together with the water sealing action of the Aquagel itself, results in a water-proof concrete.

Aquagel is of particular value in other respects, without regard to the improvement in the quality of the concrete. The improved workability of mixes of concrete and the plasticity of mortar to which Aquagel is added alone justify its use. Other advantages include lowered labor cost, lessened form leakage, absence of segregation, greatly improved curing or hydration and elimination of honeycombing and patching and greatly improved waterproofness.

There is no application of cement, mortar or concrete that is not improved by the proper use of Aquagel. There are various degrees of usefulness and various methods of use. Ordinarily, the proper amount of Aquagel to use is in the proportion of two pounds for each sack of portland cement. Much improvement in concrete is obtained by the use of one to two pounds per sack. For unusual plasticity and particularly for lean concrete, or for fireproofing, five pounds may be used. The addition of more than three pounds often leads to the use of an excess of mixing water, which is to be avoided when high strength is required. Without an increase of water the addition of Aquagel increases the strength of concrete, as may be seen from the tests given below and elsewhere in this article.

*Supplied by the Silica Products Company.

High Early Strength Cement

Special grades of Aquagel under certain circumstances produce especially strong cement, as the following tests show. Sample A is standard cement clinker ground with gypsum in the normal way, and Sample C is the same clinker finely ground with special Aquagel.

Tensile strength—1-3 sand briquets:

	A	C
24 Hrs.	100	380
7 Days	320	533
28 Days	380	605

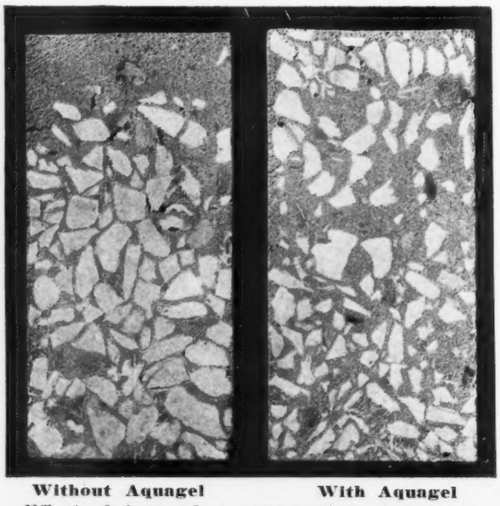
Illustrative Tests of Concrete Containing Aquagel (Same Mix)

	A	B	C	D	E	F
Aquagel, pounds per sack of cement	0	2.25	3.0	3.0	4.5	10.0
Water-cement ratio	0.87	0.87	0.69	0.69	0.87	1.30
Increased yield—bulking	0	3.7%	3.5%	3.5%	3.4%	11.8%
Crushing strength 28 days—pounds per sq. in.	1803	1966	2850x	4133xx	2123	1440

x 7-day test. xx 60-day test.

In the manufacture of high early strength by the use of Aquagel, it is necessary to use great precaution in the production of the cement clinker with which the Aquagel is to be ground. The clinker should be fairly high in lime so that tri-calcium silicate predominates. Any appreciable amount of free lime should be avoided. The alumina should be low, but not too low to prevent the necessary fluxing action of tri-calcium aluminate at reasonable burning temperatures. The finer the grind of raw materials and the more intimately they are mixed, the lower the allowable alumina content. The Aquagel maintains the colloidability and plasticity of the tri-calcium silicate so necessary for high early strength.

The cross sections are of concrete beams made in exactly the same manner with same mix, same w-c ratio and at the same time. The cement in the right hand specimen contains Aquagel.



Without Aquagel With Aquagel
Effect of Aquagel on segregation of concrete

Plasticity of Aquagel

The value of Aquagel in giving plasticity and preventing segregation may be compared with other admixture materials by reference to the illustration, where there has been added to each bottle four grams of the mineral ingredient.

Bottle No. 1—Dry Aquagel.
Bottle No. 2—Aquagel with 100 cc. of water.
Bottle No. 3—Dry diatomite or celite.
Bottle No. 4—Diatomite with 100 cc. of water.
Bottle No. 5—Dry hydrated lime.
Bottle No. 6—Hydrated lime with 100 cc. of water.
Bottle No. 7—Dry portland cement.
Bottle No. 8—Portland cement with 100 cc. of water.

It may be noted that the only material having the ability to take up a large amount of water is the Aquagel, some of the other materials actually undergo shrinkage with hydration.

Specifications for Plastic Portland Cement

Plastic portland cement shall have a plasticity value of at least 65 by the following method of test:

Ordinary portland cement, which does not have a plasticity value of 65 or more, may be used only in connection with an admixture at the time the concrete or motar is made. Such admixture shall be added to the concrete mixer along with the cement before the water is added. The amount of admixture shall be such that, when mixed with the cement alone, it is capable of bringing it up to a plasticity of at least 65. Diatomaceous silica, Aquagel or Celite are acceptable admixtures.

Method of Test

To determine the plasticity, weigh out exactly 50 grams of the dry cement containing the necessary amount of admixture, if any, into a standard four-ounce, round-shouldered, cylindrical oil bottle. Add exactly 70 cc. of distilled water to the bottle. Stop-

per and agitate vigorously for not over two minutes and until the entire mixture is fluid and no dry particles are visible or adherent to the walls of the bottle. Now place the bottle with its contents on a shaking machine which provides for rotation of the bottle at a speed of one inversion per second for a period of one hour, the bottle being so placed that its longitudinal axis rotates in a vertical plane. Immediately after taking the bottle from the shaking machine, allow it to stand upright without the slighest agitation at a temperature of not less than 70 degrees F. After 24 hours, or when the cement paste has set, carefully pour off the excess of water and measure it accurately in cubic centimeters.

With W representing the number of cubic centimeters of water,

$$\text{Plasticity} = 100\left[\frac{70\text{-}W}{50}\right]$$

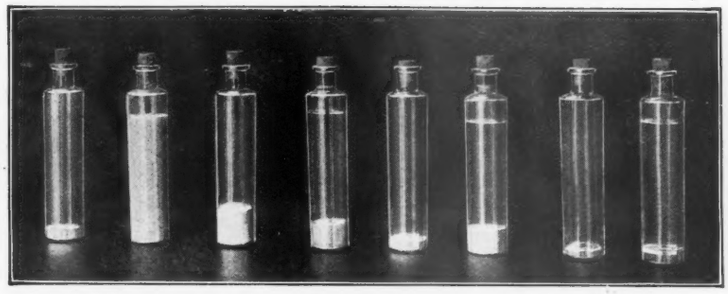
Alternative specifications for Aquagel or other admixtures for use with cement, mortar and concrete

Thoroughly mix 19 grams of Aquagel or admixture with one gram of standard portland cement. Place in a one-quart flat druggist's bottle and add 500 cubic centimeters of distilled water. Thoroughly mix so that no material adheres to the sides of the bottle. Now continuously stir by inverting on a shaking machine, revolving 7,200 times or for two hours at the rate not faster than one inversion per second. After 24 hours determine the viscosity at 70 deg. F. with the MacMichael viscosimeter, using the No. 22 wire and disc and 20 r.p.m. speed. The angular deflection is the plasticity value, which must not be less than 40.

Aquagel in Mortar

The use of Aquagel is particularly advantageous in mortar, since it has a plasticity value more than five times as great as hydrated lime or any similar material. In other words, one pound of Aquagel contributes as much to plasticity of mortar as five pounds of lime. An Aquagel putty consisting of 20 pounds Aquagel, 100 pounds limestone dust or other inert filler and 180 pounds of water is cheaper and superior to 300 pounds of lime putty.

Aquagel is free from causticity and therefore presents no dangers due to unhydrated particles, nor does it stain or cause efflorescense on brick work in which it is an ingredient of mortar, or destroy mortar colors. It contains practically no water-soluble material. Aquagel in relatively small percentage gives high plasticity to portland cement mortar and retains the full



1 2 Aquagel — 3 4 Diatomite — 5 6 Hyd. Lime — 7 8 Cement

strength of the portland cement. A much higher strength may be obtained using Aquagel in portland cement than is possible to obtain with lime putty and portland cement. A mixture of portland cement, inert filler such as ground silica, and Aquagel produces a less expensive, a stronger and a more plastic masonry cement than can be had with natural cements or with lime putty and portland cement.

	Aquagel Masonry Cement	Natural Cement A. S. T. M. Stand.
Specific Gravity	2.80	Not specified
Fineness—100 Mesh	97.0%	90.0% +
200 Mesh	86.0%	90.0% +
Soundness (Air and Water)		
Cracking	None	None
Disintegration	None	None
Checking	None	None
Distortion	None	None
Setting Time—		
Initial Set	2 Hr. 50 Min.	30 Min. +
Final Set	5 Hr. 30 Min.	5 Hr. +

Tensile Strength of Aquagel Masonry Cement (Averages)

24 Hour Neat Briquets	180 lbs.	75 lbs
7 Day Neat Briquets	375 lbs.	150 lbs.
28 Day Neat Briquets	420 lbs.	250 lbs.
7 Day 1-3 Sand Briquets	140 lbs.	50 lbs.
28 Day 1-3 Sand Briquets	250 lbs.	125 lbs.

In many instances it has been highly advantageous to add Aquagel direct to natural cements or similar masonry cements to improve the plasticity.

Commercial Masonry Cements

	Plasticity Number	Compressive Strength* Lbs. per Sq. In. 1-3 Mix With Standard Sand 7 Days	28 Days
0.	50	...	....
a.	67.8	670	1015
b.	84.0	380	859
3.	95.0	503	950
d.	112.0	758	1010
e.	126.0	399	543
f.	127.2	543	821
g.	130.0	903	1264
h.	108.8	543	888
i.	69.0	...	....

Sample 0 is plain portland cement.
Sample g is Aquagel Masonry Cement.
* Tests made by Kansas City Testing Laboratory with 12½ per cent of water.
Note.—All of these masonry cements pass the specifications of the A. S. T. M.

Aquagel Mortar Mix

The following mixture may be made on the job for excellent results as to binding power, plasticity and strength:

Mortar Sand	1,500 lbs.
Fine Inert Filler	300 lbs.
Portland Cement	2 sacks
Aquagel	30 lbs.
Water	To desired consistency

This mixture gives much greater strength than natural cement mortars. The filler may be any ground inert mineral such as silica, dolomite or limestone dust at least 85 per cent of which passes a 200 mesh screen. For colored mortar the pigment may be added to the mix or in some localities may be obtained already mixed in the Aquagel.

Aquagel may be used with any type of stucco or to produce a plastered wall exposed to the action of water. It may be applied in the form of Aquagel masonry cement with or without portland cement to advantage.

Cement, Masonry
United States Government Master Specification No. 443

(a) **Fineness**—The residue on a standard number 200 sieve shall not exceed 20 per cent by weight. Cement shall not be rejected for failure to meet this test if after drying at 100 deg. C. for one hour and resieving it meets this requirement.

(b) **Time of Setting** — The neat cement paste, mixed to normal consistency, shall not develop initial set in less than 45 minutes as determined by the Vicat needle, or 60 minutes as determined by the Gillmore needle. Final set by either method shall be attained within 48 hours.

(c) **Soundness**—Pats of neat cement, after being stored for seven days, one in laboratory air and one in water, shall be firm and hard and show no signs of distortion, cracking, or disintegration under both conditions of storage. Mortar strength specimens at the time of test shall show no signs of distortion, cracking, or disintegration.

(d) **Strength** — The average compressive strength in pounds per square inch of not less than three 2-inch cubes, made of mortar composed of 1 part cement and 3 parts sand by weight, shall be not less than 175 at the age of seven days. The average strength attained at 28 days shall not be less than attained at seven days.

Rejection—The cement shall be rejected if it fails to meet any of the requirements of this specification. Cement remaining in storage prior to shipment for a period greater than six months after test shall be retested and shall be rejected if it fails to meet any of the requirements of this specification.

Architects' and Engineers' Specification for Mason's Cement

Plasticity—All cement used in masonry work shall have a plasticity value of 100 or more when tested in accordance with the following method:

Weigh out exactly fifty grams of the dry cement into a standard four-ounce cylindrical oil bottle. Add seventy cubic centimeters of distilled water. Stopper and stir thoroughly until the entire mixture is fluid. Shake for one hour by inverting once per second.

Stand the bottle upright without the slightest agitation at a temperature no less than 70 deg. F. After 24 hours, or when the cement has set, carefully pour off the excess of water and measure it accurately in cubic centimeters.

* This specification is also applicable to the selection of a proper admixture for plasticity.

With W representing the number of cubic centimeters of water,

$$\text{Plasticity} = 100\,\frac{70-W}{50}$$

Strength—The average compressive strength in pounds per square inch of not less than three 2-in. cubes made of mortar composed of one part cement and three parts sand and 12.5 per cent of water by weight shall be not less than 750 lbs. per sq. in. at the end of seven days and 1,000 lbs. per sq. in. at the end of 28 days.

The importance of mortar strength and binding power is indicated by the following tests from the National Bureau of Standards:

Comparative tests of brick walls using the same brick but different mortars.

Compressing strength of brick= 3540 lbs. per sq. in.

BUREAU OF STANDARDS MASONRY TESTS

Type of Wall	Mortar	Compressive Strength—Lbs. Per Sq. In. of Gross Cross-Sectional Area Max.	Min.	Avg.
8-inch solid wall	1 part portland cement, 3 parts sand	1303	893	1081
12-inch solid wall	1 part portland cement, 3 parts sand	1345	1114	1209
8-inch solid wall	1 part portland cement, 1 part lime, 6 parts sand	1062	760	909
12-inch solid wall	1 part portland cement, 1 part lime, 6 parts sand	1048	939	984

A. S. T. M. Standard Specifications for Natural Cement
Serial Designation: C 10-09

Fineness—The residue on a standard No. 100 sieve shall not exceed 10 per cent and on a standard No. 200 sieve shall not exceed 30 per cent, by weight.

Soundness—Pats of neat cement about 3 inches in diameter, ½-inch thick at center, tapering to a thin edge, shall be kept in moist air for a period of 24 hours.

(a) A pat shall then be kept in air at normal temperature.

(b) Another pat shall be kept in water maintained as near 70 deg. F. as practicable.

These pats shall be observed at intervals for at least 28 days, and, to satisfactorily pass the tests, shall remain firm and hard and show no signs of distortion, checking, cracking, or disintegration.

Time of Setting—The cement shall not develop initial set in less than 10 minutes, using the Vicat needle. Final set shall be attained in not less than 30 minutes nor more than 3 hours, using the Vicat needle.

Tensile Strength—The minimum requirements for tensile strength for briquets 1 sq. in. in cross-section shall be as follows and the cement shall show no retrogression in strength within the periods specified:

Neat Cement

Age—	Strength
24 hours in moist air	75 lbs.
7 days (1 day in moist air, 6 days in water)	150 lbs.
28 days (1 day in moist air, 27 days in water)	250 lbs.

One Part Cement, Three Parts Standard Ottawa Sand

7 days (1 day in moist air, 6 days in water)	50 lbs.
28 days (1 day in moist air, 27 days in water)	125 lbs.

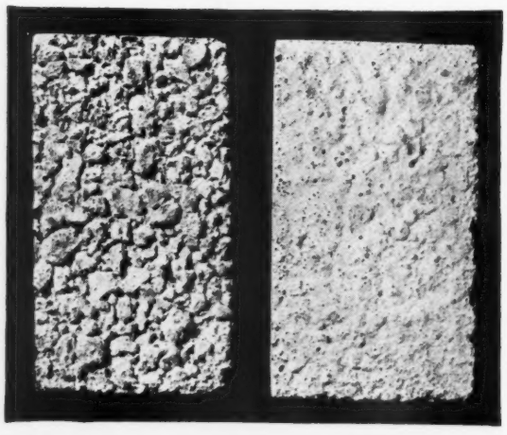
Aquagel Light Weight Concrete

Aquagel is almost indispensable for the proper handling of light weight aggregate concrete. The usual types of light weight aggregate are cinders and burnt shale. Both of these materials are very harsh and, unless some plasticizing agent is used, there is a great tendency for the cement to wash out and fail to give the proper bond. There is improvement both in the strength and workability by the use of Aquagel in the cement.

This action is illustrated by the following tests, which were carried out on the nineteenth floor of the new twenty-eight story Kansas City Telephone Building. These tests, with and without Aquagel, were made on light weight aggregate concrete poured in the floor slab of the nineteenth floor. Exactly the same amounts of water and other materials were used in each case except that the Aquagel-treated concrete contained three pounds of Aquagel for each sack of cement used. The concrete to which the Aquagel was added was easily workable, highly plastic and kept in the form work perfectly, without loss of cement even when subjected after pouring to a heavy rain. The plain concrete was harsh and cindery, segregated badly, was difficult to place, leaked badly through the form work and was injured by the washing of the rain.

Tests of Light Weight Concrete from Kansas City Telephone Building (Made by Kansas City Testing Laboratory)

	Without Aquagel	With Aquagel
Mix	1-2-3	1-2-3
Water-cement ratio	About 0.75	About 0.75
Slump test	7 in.	2.5 in.
Size of specimens tested	6 in. x 12 in.	6 in. x 12 in.
Age of concrete	28 days	28 days
Weight of concrete per cu. ft.	108.6 lbs.	103.9 lbs.
Crushing strength—		
Actual	87,890 lbs.	106,940 lbs.
Per sq. in.	3,109 lbs.	3,782 lbs.
The same concrete at 7 days:		
Age of concrete	7 days	7 days
Crushing strength—		
Actual	47,090 lbs.	56,100 lbs
Per sq. in.	1,665 lbs.	1,984 lbs



Without Aquagel **With Aquagel**
Effect of Aquagel on segregation

Effect of Aquagel on Harshness and Workability of Concrete

The illustration shows surfaces of concrete (light weight burned shale aggregate) with exactly same mix, same water cement ratio, except that sample on right contains 2 pounds of Aquagel per bag of cement.

Aquagel for Central Mixing Plants

Aquagel is of especial value in ready mixed concrete plants, particularly when the concrete is to be hauled for a considerable distance. In this kind of concrete, by the use of Aquagel it is possible to have superior workability, easy flowing properties and greater strength, even though the slump test is very much less. Aquagel always reduces the slump. It prevents the aggregates from packing in the bottom of the load and the water from separating on the top. A truck of Aquagel-treated concrete, even though the slump is low, readily slides out of the truck; whereas a load of untreated concrete segregates and packs badly in the bottom of the truck.

The following tests were made of concrete mixed in a central plant, hauled eight miles and used in the plant of the Sheffield Steel Corporation now under construction in Kansas City.

The loads arrived at the job without any evidence of segregation and with no free water showing at the top of the load. The appearance and character of the concrete was much superior to that of the plain concrete hauled in exactly the same manner.

Universal Application of Aquagel

Aquagel may be used in connection with practically every application of cement, mortar or concrete; and may be used in connection with natural cements advantageously. In the new Chevrolet assembling plant occupying approximately ten acres of ground and now nearing completion in Kansas City, it was used in all of the masonry work and in all of the superstructure concrete. The contractor on this job, who was experienced in building some of the largest structures in this part of the country in record time, finds that Aquagel effects a large financial saving to him. Illustrative tests of concrete produced are given in the tables which accompany this article. It will be observed that the concrete in which Aquagel was used contains a higher water-cement ratio, yet gives a higher strength. This is one of important factors in its use.

Physical and Chemical Properties of Aquagel

Aquagel is obtainable in various grades representing the different stages of manufacture. It is composed entirely of inert mineral ingredients. It is designed to take the place of a variety of materials that swell or form a gel with water. It is capable of taking up from 2,000 to 4,000 per cent of water, depending upon the particular grade. Hydrating action takes place fairly quickly, but unless the finely powdered grade is used, is not complete until about 24 hours after mixing. The character of the gel is exhibited by the illustration on the last page of this circular. It will be noted that the Aquagel, when completely hydrated with the proper amount of water, does not flow even when the container is inverted.

Chemical Composition

The exact chemical composition of Aquagel depends upon slight variations in the method of manufacture. The following, however, is representative:

	—Aquagel— No. 5	No. 0
Loss on ignition	6.0%	6.1%
Silica SiO_2	58.2%	62.4%
Alumina Al_2O_3	21.9%	24.6%
Iron Oxide Fe_2O_3	3.8%	3.2%
Lime CaO	5.9%	0.4%
Magnesia MgO	2.4%	2.4%
Sulphur SO_3	0.9%	0.5%
Chlorides Cl	0.2%	0.2%
Alkalies Na_2O, K_2O, etc.	0.7%	.2%
	100.0%	100.0%

Physical Properties

The weight of Aquagel in lump form is about 56 lbs. per cu. ft. In the pulverized form as placed on the market it weighs about 60 lbs. per cu. ft. The specific gravity of the mineral is 2.4. The hydrate of Aquagel is not in very firm combination, as practically all of the water dries out completely without the use of high temperatures. However, the gelatinizing value may be made completely reversible or in part irreversible. In some uses it is desirable to have it reversible and in others it is desirable to have it acted upon by water after having once formed a gel. The color of dry Aquagel is practically white, but when wet the color is slightly grayish.

Oiled Aquagel

Aquagel when treated with oil is particularly useful in waterproofing concrete and in curing the surface of concrete roads. In the latter use it may be applied dry and then treated with water or it may be applied as a water gel.

SHEFFIELD TESTS

	Aquagel Concrete		Plain Concrete	
Size of Specimen	6″x12″ cyl.	6″x12″ cyl.	6″x12″ cyl.	6″x12″ cyl.
Mix	Cement	4 sacks	Cement	4 sacks
	Sand	860 lbs.	Sand	860 lbs.
	Rock	1060 lbs.	Rock	1040 lbs.
	Aquagel	12 lbs.	Aquagel	None
Consistency of Mix, Slump	Approx. W-C ratio 0.75		Approx. W-C ratio 0.70	
	6 in.	6 in.	6¼ in.	7¾ in.
Storage of Specimen	In water	In water	In water	In water
	at 70° F.	at 70° F.	at 70° F.	at 70° F.
Age	28 days	28 days	28 days	28 days
Crushing Strength:				
Actual	103260 lb.	106120 lb.	99970 lb.	101010 lb.
Per sq. in.	3652 lb.	3753 lb.	3536 lb.	3573 lb.

CHEVROLET TESTS

	Plain Concrete Cylinders		Aquagel Concrete Cylinders	
Size of Specimen	6″x12″ cyl.	6″x12″ cyl.	6″x12″ cyl.	6″x12″ cyl.
Mix	Rock	4300 lbs.	Rock	4300 lbs.
	Sand	2800 lbs.	Same mix with	
	Water	70 gals.	Water	70 gals.
	Cement	1128 lbs.	Aquagel	33⅓ lbs.
Consistency of Mix, Slump	7⅛ in.	7⅛ in.	2¼ in.	2¼ in.
Storage of Specimen	In water	In water	In water	In water
	at 70° F.	at 70° F.	at 70° F.	at 70° F.
Age	28 days	28 days	28 days	28 days
Crushing Strength:				
Actual	78850 lb.	85150 lb.	84780 lb.	86480 lb.
Per sq. in.	2789 lb.	2658 lb.	2999 lb	3059 lb.
Weight of Specimen	29.00 lb.	28.75 lb.	28.56 lb.	28.44 lb.
Weight per cu. ft.	145.2 lb.	144.0 lb.	143.1 lb.	142.5 lb.

Water-Cement Ratio Law

For a given set of conditions and materials, the strength, and other desirable qualities of concrete are determined by the amount of mixing water—provided the mixture is workable and plastic.

The water-cement ratio is expressed in terms of cubic feet of water used for each sack (94 pounds or one cubic foot) of portland cement.

It is often convenient to convert water-cement ratio as commonly understood into per cent of water, pounds of water per sack and gallons of water per sack of cement, and the following table is useful for this purpose.

Per cent water by weight	Lbs. water per sack	Water-Cement Ratio	Gals. water per sack	Typical compressive strength lbs. sq. in.
20	18.8	0.30	2.24	7200
25	23.5	0.38	2.84	6300
26.7	25.0	0.40	3.00	6100
30	28.2	0.45	3.37	5400
33.3	31.2	0.50	3.74	4800
35	32.9	0.53	3.97	4400
40	37.6	0.60	4.49	3800
45	42.3	0.68	5.08	3600
46.7	43.7	0.70	5.24	3000
50	47.0	0.75	5.61	2700
53.3	49.9	0.80	5.98	2500
55	51.7	0.83	6.21	2300
60	56.4	0.90	6.74	2000
63	59.2	0.95	7.08	1900
65	61.1	0.98	7.33	1800
67	62.4	1.00	7.48	1700
70	65.8	1.05	7.90	1500
73	69.0	1.10	8.27	1300
75	70.5	1.13	8.46	1200
80	75.2	1.20	9.02	1000
85	79.9	1.28	9.59	850
90	84.6	1.36	10.16	800
95	89.3	1.43	10.72	600
100	94.0	1.50	11.29	500

The following are the approximate conversion factors for the above values:

WC = Water-cement ratio by volume.
% = % water by weight of cement.
Gals. = Gallons of water per sack.
Lbs. = Pounds of water per sack of cement.

From	To WC	%	Gals.	Lbs.
WC	1.00	66.67	7.53	62.4
%	0.015	1.00	0.113	0.94
Gals.	0.134	8.93	1.00	8.34
Lbs.	0.016	1.06	0.12	1.00

QUANTITY OF MATERIALS FOR CONCRETE

Cement	Sand	Stone	Packed Cement bbl.	Loose Sand cu. ft.	Loose Stone cu. ft.	Volume of Mortar in Terms of % of Volume of stone	Per Cu. Yd. of Concrete: Cement bbl.	Sand cu. yd.	Stone cu. yd.
1	1	1½	1	3.8	5.7	99	3.19	0.45	0.67
1	1	2	1	3.8	7.6	75	2.85	0.40	0.80
1	1	2½	1	3.8	9.5	61	2.57	0.36	0.90
1	1	3	1	3.8	11.4	51	2.34	0.33	0.99
1	1½	2	1	5.7	7.6	93	2.49	0.53	0.70
1	1½	2½	1	5.7	9.5	76	2.27	0.48	0.80
1	1½	3	1	5.7	11.4	64	2.09	0.44	0.88
1	1½	3½	1	5.7	13.3	55	1.94	0.41	0.96
1	1½	4	1	5.7	15.2	49	1.80	0.38	1.01
1	1½	4½	1	5.7	17.1	44	1.69	0.36	1.07
1	1½	5	1	5.7	19.0	40	1.59	0.34	1.12
1	2	3	1	7.6	11.4	75	1.89	0.53	0.80
1	2	3½	1	7.6	13.3	65	1.76	0.49	0.87
1	2	4	1	7.6	15.2	57	1.65	0.46	0.93
1	2	4½	1	7.6	17.1	51	1.55	0.44	0.98
1	2	5	1	7.6	19.0	47	1.47	0.41	1.03
1	2	5½	1	7.6	20.9	43	1.39	0.39	1.08
1	2	6	1	7.6	22.8	40	1.32	0.37	1.11
1	2½	3	1	9.5	11.4	87	1.72	0.61	0.73
1	2½	3½	1	9.5	13.3	75	1.62	0.57	0.80
1	2½	4	1	9.5	15.2	66	1.52	0.54	0.86
1	2½	4½	1	9.5	17.1	60	1.44	0.51	0.91
1	2½	5	1	9.5	19.0	54	1.37	0.48	0.96
1	2½	5½	1	9.5	20.9	49	1.30	0.46	1.01
1	2½	6	1	9.5	22.8	46	1.24	0.44	1.05
1	2½	6½	1	9.5	24.7	42	1.18	0.42	1.08
1	2½	7	1	9.5	26.6	40	1.13	0.40	1.11
1	3	4	1	11.4	15.2	76	1.42	0.60	0.80
1	3	4½	1	11.4	17.1	68	1.34	0.57	0.85
1	3	5	1	11.4	19.0	61	1.28	0.54	0.90
1	3	5½	1	11.4	20.9	56	1.22	0.52	0.94
1	3	6	1	11.4	22.8	52	1.16	0.49	0.98

(Continued on page 79)

Applications of Air Separation Are Numerous in Non-Metallic Mineral Plants*

By Rubert M. Gay

ALTHOUGH air separation dates back to the earliest days and has been used to a limited extent for the separation of various non-metallics, only within the last ten years has this method become standard practice for separating many of these materials. In this article I shall outline the history of air separation briefly and explain in a general way with the aid of flow sheets the arrangement of separators in connection with various types of machinery

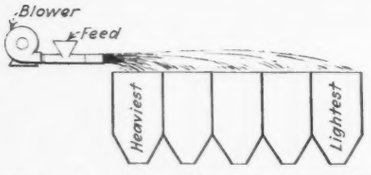


Fig. 1—A crude method of separating materials by air

used for reduction of the commoner non-metallics. The reader should understand that the arrangement of plants varies with different grades of material and different requirements.

The earliest air separator was the wind which "winnowed the chaff from the wheat." For many years fans and blowers have been employed to create an artificial wind, which was directed through the material to be separated. The fanning mill and the aspirator, used principally for cleaning grain, are examples of these types. Material was also introduced into a stream of air from a blower and passed horizontally over bins or around baffles, the heavier particles (being acted on more strongly by gravity) dropping out of the air current first, while the lighter ones were carried to the bins further away from the outlet (Fig. 1).

The cyclone dust collector has been used as a separator to a considerable extent. By arranging several of these collectors in series by connecting the outlet of one to the inlet of the next, a fairly satisfactory separation can be made. There is considerable difference in the general proportions of these dust collectors, and although some have a number of tangential inlets spaced around the circumference, the majority have only a single opening. The cyclone dust collector separates by a combination of two different forces: first, the centrifugal effect caused by the tangential introduction of the material at high velocity, and, second, that of gravity, which causes the heavier particles to fall out of the expanded air. If the air current is drawn out of the cyclone by a suction fan instead of being forced in by a blower, a partial vacuum is created within and a better operation obtained (Fig. 2).

A type of air separator which has been used for many years consists of an outer casing carrying a fan in the upper part; an inner or separating chamber below the fan which has openings in the top and bottom; and a lower inner conical section below the separating chamber, this cone having an outlet in the lower apex. The fan in the top of the separator draws air from the inner chamber and forces it into the space surrounding the latter, from which it enters the bottom of the chamber. Material to be separated is introduced into the separating chamber in various ways, the most common consisting of a revolving disk. Material is fed onto the center of the disk and is thrown off in a thin sheet by the centrifugal force created by the rotation of the disk. The air, passing upwardly through the annular space between the edge of the disk and the inner wall of the separating chamber, picks up the lighter material and deposits in the outer casing with a whirling action induced by the fan, which throws the material against the wall of the outer casing, down which it falls by gravity to an outlet in the lower end. In this operation the heavier particles fall by gravity and are collected in the cone below the separating chamber.

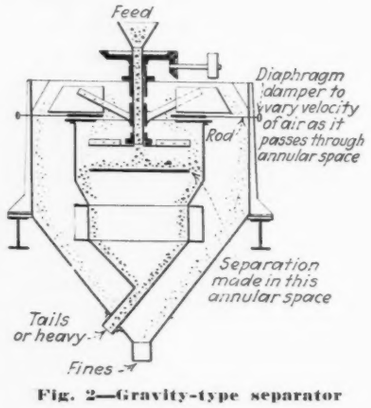

Feed
Diaphragm damper to vary velocity of air as it passes through annular space
Rod
Separation made in this annular space
Tails or heavy
Fines

Fig. 2—Gravity-type separator

The weight of the particles carried up by the fan is determined by the velocity of the air, as it passes through the curtain of material thrown off by the distributor disk, those too heavy to be carried by the air current falling by gravity. To regulate the velocity of the air in the annular space surrounding the disk, dampers are commonly used, or variable-speed motors, or devices to change the speed of the fan. Fig. 2, shows a common type of low-velocity air separator which, with unimportant modifications, has been used for many years.

A somewhat different type of separator is shown in Fig. 3. This is a high-velocity gravity separator, the material being fed into a high-velocity stream of air entering the bottom of

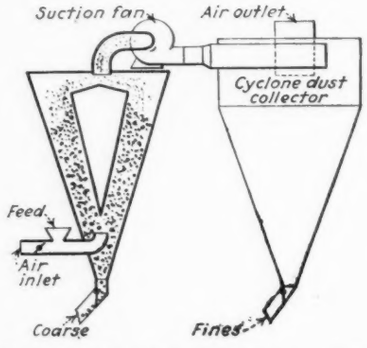


Fig. 3—High-velocity gravity separator

an expansion chamber, which has an outlet at the top connected to an ordinary cyclone dust collector, and an outlet for the heavier particles in the bottom, the velocity of the air entering the chamber being usually controlled by a damper.

Many objections can be made to the various methods of separation so far described, the principal one being the fact that the slightest variation in the air velocity changes the product. Another serious fault is that, in all cyclone and gravity separators, eddy currents are induced which make their action uncertain and variable. For fine separation their capacity is limited by the fact that gravity is the only means of removing the undesired particles and the weight of comparatively small particles is insufficient to cause them to fall out of even a slow air current.

About ten years ago an entirely new principle of air separation was introduced, and this has revolutionized the dry separating industry. This was the substitution of a positively created and adjustable centrifugal action opposed to a moving air current to separate the heavier particles from the lighter. With the gravity separator, the sizing is limited by the fact that beyond a certain point the weight of the particle cannot overcome the carrying effect of the air, but with the centrifugal, there is no limit to the fineness of particles that can be eliminated.

* Reprinted from Jan. 23, 1930, Engineering and Mining Journal, a McGraw-Hill publication.

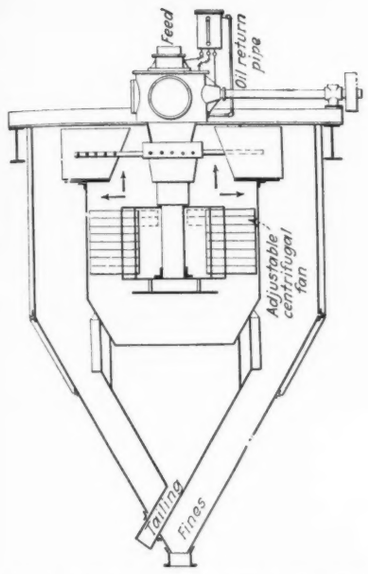


Fig. 4—The centrifugal air separator. This has no dampers, all adjustments being made by moving the blade sections in or out

In the centrifugal separator (Fig. 4) the material is spread by a distributing disk as in the gravity machine, but instead of separating in the annular space surrounding the disk, practically all of the material is carried up into the separating zone above the disk, where it is positively rotated by means of a fan having hundreds of steps of adjustment. The centrifugal action generated forces the particles to the outside of the upwardly moving current of air and the heavier ones (being acted on more strongly than the lighter ones) reach the outside of the air column before the lighter ones reach the opening in the top of the chamber.

Inasmuch as the fan which causes the upward motion of the air is attached to the same shaft that rotates the centrifugal sizing fan, any change in speed effects both equally, the opposing forces remain balanced, and the size of the product is not affected. To distinguish the centrifugal from the gravity separator is easy as the former has no dampers or adjustable choke deflectors and requires no changes of speed to vary the product.

In the centrifugal separator, the driving mechanism and all moving parts are carried on heavy horizontal structural steel beams, which also carry the steel shell, and no vibration is transmitted to the sheet-metal casings. The centrifugal is fed through a hollow shaft of sufficient size to carry any amount of material the separator will ever have to handle, and it also has an automatic circulating oil system, which maintains a constant flow of oil through all bearings and over the gears, returning the oil to the supply reservoir for cleaning and cooling.

Practically all non-metallic minerals may be advantageously separated by air, and to obtain the fine and superfine products now in demand these separators are absolutely necessary. Following are some of the materials successfully handled by modern centrifugal air separators; borate ore, borax, barytes, coal, shale, slate, phosphate rock, gypsum and plaster, limestone, hydrated and caustic lime, salt, garnet, emery, graphite, mineral colors, clay, borite, kaolin, magnesite, diatomite, talc, and fullers earth.

For many years fibrous talc had been ground in so-called dump cylinders, inasmuch as no air separators built prior to 1920 would handle this material. About ten years ago W. H. Loomis (whose foresight is proved by the fact that his company is today the largest producer of this material in the world) installed the first two centrifugal air separators manufactured. Some seven of these machines are now used by his company. A description of the Loomis plant as it was at that time was published in *Engineering and Mining Journal* of Sept. 1, 1923, but since then the business has greatly expanded, the amount of equipment increased, and many modern scientific methods have been introduced, together with a laboratory in charge of a competent chemist. The flow sheet published in 1923 gives a general idea of the arrangement of machinery, although some modifications have naturally been necessary to meet the varying requirements of a constantly growing business. The general flow sheet is given in Fig. 5.

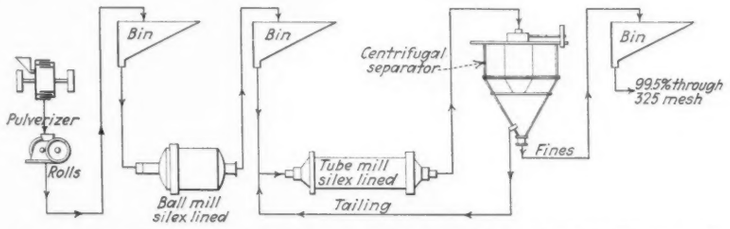


Fig. 5—Flow sheet showing air separation in a plant treating fibrous talc

A considerable number of manufacturers of talc products are now using the same type of separators for making rubber filler, roofing talc, and various other products. Fig. 6 shows a typical flow sheet for such a plant.

To the Bedford Mining Company belongs the credit of being the first to install the centrifugal separator in a feldspar grinding plant. This was nearly ten years ago at that company's plant in Bedford, N. Y., and the original machine is still in operation and giving satisfactory service. This installation was soon followed by one at the Golding-Keene plant at Keene, N. H., where two of these separators were installed. This plant was fully described by Raymond B. Ladoo, then of the U. S. Bureau of Mines, in Bulletin 2396, published in September, 1922. It is operating today with no substantial changes from the first flow sheet, which is shown in Fig. 7, except that more mills and separators are used. Fig. 8 shows a somewhat more elaborate flow sheet. Since that time some fifty of these separators have been installed in the spar, silica, and quartz field, and they are now considered standard equipment on these materials.

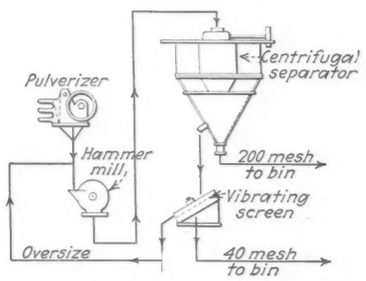


Fig. 6—Flow sheet of a plant producing roofing talc and filler

Twenty years or more ago gravity air separators were used to a considerable extent in the cement industry, but as the requirements became more exacting these machines were discarded, for they could not meet the new specifications. By 1915 few if any plants in this country were using them on either clinker or raw materials. Shortly after the centrifugal separator

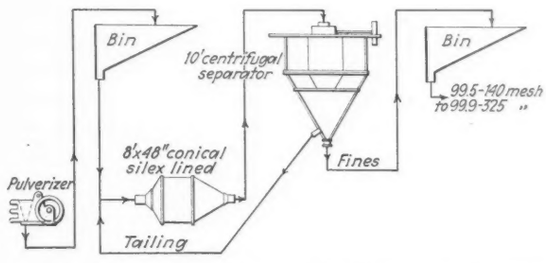


Fig. 7—Flow sheet of a feldspar-grinding plant of 1½ tons capacity

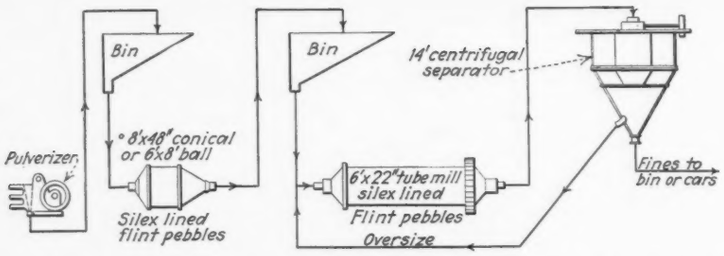


Fig. 8—Another flow sheet of a feldspar and quartz plant of 3-4 tons' capacity

was introduced, however, the Alpha Portland Cement Company, which has always been a pioneer in introducing new methods, installed one of these machines at its Janesville plant, where it proved so satisfactory that practically all of its plants were equipped with the centrifugal. Between 35 and 40 have been purchased by this one company. Numerous other cement companies have installed this type of separator, including the Wabash Portland Cement Company, which uses such separators at both of its plants and has recently purchased two 16-ft. machines, which will be installed within the next month or so.

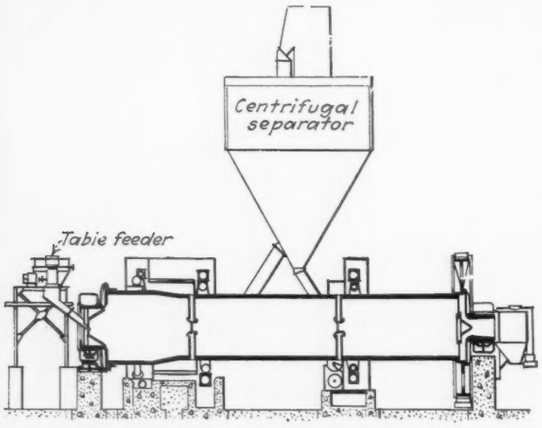


Fig. 9—A cement plant layout, showing a three-compartment dry-grinding Compeb mill with a centrifugal air separator in closed circuit with the intermediate mill compartment

In cement plants so many types of mills are used, and the plants are arranged in so many ways, that to give a typical flow sheet is difficult. However, the practice in general is to hook the separators up in closed circuit with the grinding mills—that is, the mill product is elevated to the separators, the fines are removed, and the oversize is returned to the feed end of the mill. In some plants there is no room above the mills, and the product of several mills is conveyed to a battery of separators, sized, and the oversize returned to the mill feed bins. Recently tube mills having two or more compartments with separate outlets have become quite popular. With mills of this type separators may be used in closed circuit with the last compartment of two-compartment mills or with either the middle or last compartment, or both, in the three-compartment type. Wherever these separators have been installed they have improved the plant operation materially by regulating the mesh of the product and increasing the fineness and also the capacity. Fig. 9 shows a three-compartment dry-grinding Compeb mill having a centrifugal air separator in closed circuit with the intermediate compartment.

Ground limestone is one of the nonmetallics which has a large use outside of the cement industry, and numerous plants prepare this material for agricultural purposes, rubber filler, paint filler, and many other uses. Most agricultural colleges recommend a comparatively fine product. Undoubtedly the tube mill is the most satisfactory means for producing this material, particularly if there is a market for rubber filler and the finer "air float."

The Limestone Products Company, Newton, N. J., was one of the first to realize the possibilities of producing a superfine air-floated product by the use of centrifugal separators. It installed its first machine a number of years ago and has since installed two additional machines to care for the increased demand. This company makes both agricultural limestone and air float, the latter testing about 99 per cent through 300 mesh. The flow sheet in Fig. 10 illustrates a practical ground-limestone plant.

Diatomite is used largely for filtration, insulation, polish, as an admixture in concrete, and for numerous other purposes. Its character varies greatly in different deposits and until recently no commercial separator has been found that would clean or grade it satisfactorily, and each producer has worked out his own crude apparatus for handling it. Nearly all of the plants now in operation use various combinations of cyclone dust collectors and bins, over which the material is blown.

Most commercial diatomite contains sand, broken diatoms, and dust and varies in mesh and weight because of the fact that it is impossible to regulate dust-collector products. Commercial gravity and high-velocity separators have been tried from time to time, but have failed to give even as good results as the crude home-made dust-collecting outfits. During the last two years a large amount of experimental work has been done on this material with the centrifugal air separator in the United States and by the Canadian Bureau of Mines, under supervision of experts on this particular material. Results have been extremely satisfactory, and the products obtained are far superior to those made by any other method. The results have been equally good on all of the various diatomites tested, including the light Florida material, the heavier from Eastern Canada, and that from Maryland, Virginia, and the Western states. The centrifugal separator has been found to remove all traces of sand, and as little or as much of the finest material as wanted, and it grades the product into as many sizes as may be desired.

Fig. 11 gives a typical flow sheet of a plant for removing the sand and dust and making two grades of filtration material. This unit can, however, be easily adjusted to produce any grade for which the raw material is suitable.

Clays such as kaolin, china clay and the like require treatment somewhat different from that demanded by most other materials because they usually contain silica and other foreign mat-

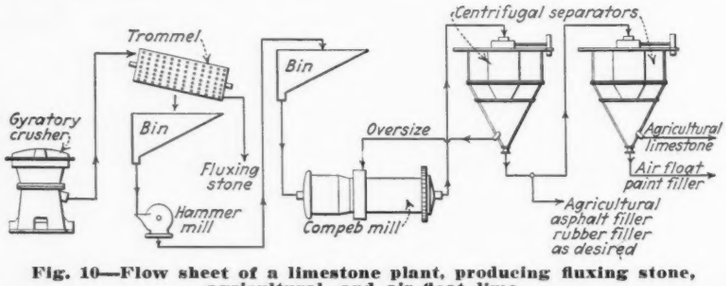


Fig. 10—Flow sheet of a limestone plant, producing fluxing stone, agricultural, and air-float lime

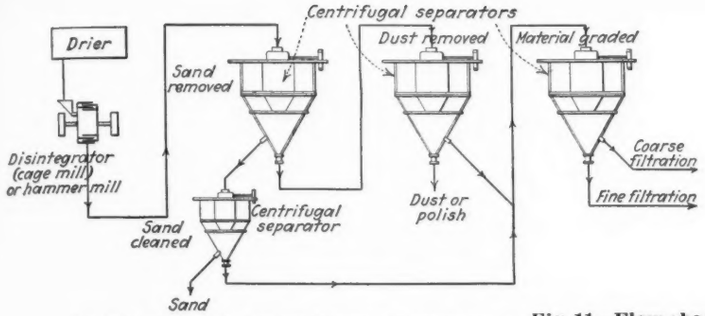


Fig. 11—Flow sheet of a diatomite plant

ter which must be removed. As the material leaves the pulverizer it is usually fine enough. The problem is to remove the fine silica without too much waste. For years water flotation has been used to clean these materials, but it has been found that the centrifugal air separator will do the work cheaper and better. At least a dozen of these machines have been installed in the clay field during the last year or so.

Silica as found in clays is often of almost microscopic fineness, so that it is usually necessary to resort to double separation—that is, taking off part of the fines in the first separation, then sending the oversize to a second separator, and again taking off the remainder. Sometimes a third separation is advisable and a recovery of 85 to 90 per cent can be made. Owing to the extreme fineness of this material, ordinary air separators are useless, as the particles of silica are too light to fall out of the clay by gravity. Air separation has been effective in this field only because of the tremendous centrifugal effect of the fan in the centrifugal separator. A typical flow sheet for cleaning and sizing clays containing finely divided silica is given in Fig. 12. When the silica is in the form of large grains of sand, a single separation is all that is required to remove it as well as lumps and foreign matter.

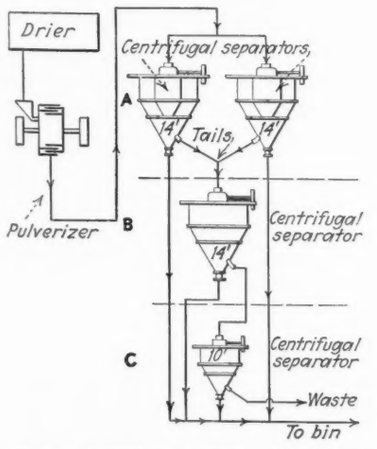


Fig. 12—A typical flow sheet for cleaning and sizing clays

For clays containing only coarse sand unit **A** is used. For clays containing fine sand units **A** and **B** are applicable; and for clays containing microscopic sand units **A, B** and **C.**

Use of Aquagel

(*Continued from page* 75)

Light Weight and Fireproof Concrete

The more important departure from the usually recognized types of concrete has been in the manufacture of light weight aggregate and light weight mortars for light weight concrete. The chief problem in production of such a material has been that of attaining sufficiently high compressive strength. The methods pursued have consisted in the use either of a cellular aggregate or a porous mortar. Light weight aggregates are obtained from the following sources:

(1) Cinders from boiler plants especially selected and washed.
(2) Specially manufactured aggregate by heating crushed shale to incipient fusion and intumescence as provided for in the U. S. Olsen Patent No. 1,314,752, and the British Patent No. 132, 593 of 1919.
(3) From swelled bricks or burnt clay which has been prepared by pulverizing and admixing with proper flux materials or gasifying substances such as organic material.
(4) Crushed coke, as obtained by the high pressure coking of coal or pitch.
(5) Tufa or pumice, as naturally found in mountain districts.
(6) Furnace slags from metal refining.

Normal concrete has a weight of about 150 pounds per cubic foot, and it is apparent then that light weight concrete of equal strength weighs from 90 to 105 pounds per cubic foot.

COMING EVENTS

Apr. 5-9, 1930. New York, N. Y.; Hoboken, N. J.; Washington, D. C. Fiftieth anniversary meeting, American Society of Mechanical Engineers, at American Machinist offices in New York; Stevens Institute, Hoboken; U. S. Chamber of Commerce Bldg., Washington.

April 5-9, 1930, Cincinnati, O. Seventh annual meeting and exposition, American Mining Congress. James Callbreath, sec., Washington, D. C.

April 7-11, 1930. Atlanta, Ga. Annual meeting, American Chemical Society.

April 15, 1930. Albany, N. Y. Portland Cement Association regional safety meeting, at Hotel Ten Eyck. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

Apr. 20-27, 1930. Mexico City, Mex. National Highway Commission of Mexico third highway congress. Chas. M. Upham, engineer-director, American Road Builders' Association, can furnish particulars.

April 25, 1930. Chicago, Ill. Midwest regional meeting, Employees' Publication section, National Safety Council. Chas. A. Ward, general chairman, 20 N. Wacker Drive, Chicago.

April 26, 1930. New York, N. Y. Eastern regional meeting, Employees' publication section, National Safety Council. Stanley W. Wood, chairman, 65 Broadway, New York, N. Y.

May 12, 1930. Cleveland, O. Meeting, Steel Founders' Society of America. G. P. Rogers, managing director, 932 Graybar Bldg., New York, N. Y.

May 29, 1930. Easton, Pa. Portland Cement Association regional safety meeting, at Hotel Easton. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

June 16-25, 1930. Berlin, Germany. World Power Conference. World Power Conference Program Committee, Room 818, 29 W. 39th St., New York, N. Y.

June 24, 1930. Cleveland, O. Portland Cement Association regional safety meeting, at Hotel Cleveland. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

June 26, 1930. Washington, D. C. Portland Cement Association regional safety meeting, at Hotel Raleigh. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

July 1, 1930. Detroit, Mich. Portland Cement Association regional safety meeting, at Book-Cadillac Hotel. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

Sept. 9, 1930. Seattle, Wash. Portland Cement Association regional safety meeting, at New Washington Hotel. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

Sept. 16, 1930. San Francisco, Cal. Portland Cement Association regional safety meeting, at St. Francis Hotel. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

Sept. 16-18, 1930. Louisville, Ky. Ninth International First-Aid and Mine-Rescue Contest. U. S. Bureau of Mines and Joseph A. Holmes Safety Assn. Scott Turner, director, U. S. Bureau of Mines, Washington, D. C.

MANUFACTURERS' PUBLICATIONS

Each publication listed below contains information of interest to non-metallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention PIT AND QUARRY *when making such requests.*

Bodies, Concrete

Mix-Haul Mixes While Hauling. 4 p., 7 ill. (Folder. Chain Belt Co., Milwaukee, Wis.) Illustrates the Rex Mix-Haul body loading, hauling and discharging, and describes its superior construction for its adaptability to mixing while hauling.

All Types of Construction Are Served by the Bartlett-Snow Movable V Concrete Body. 12 p., 16 ill. (Bulletin No. 65. The C. O. Bartlett & Snow Co., Cleveland, O.) Shows and describes a number of jobs and points out that the movable V concrete body is a means of giving central mixing plant operators lower transportation costs.

Brick Manufacture

The Manufacture of Silica Building Brick. 24 p., 20 ill. (Catalog No. 3003, W. A. Riddell Co., Bucyrus, O.) A comprehensive discussion of the manufacture of silica brick with a view to prove how easy it is to get into the business and including the necessary machinery.

Buckets

Bucket Pick-Ups. 4 p., 11 ill. (March, 1930. The Hayward Co., New York, N. Y.) Illustrates different types of buckets and encloses card for use in taking a census of its friends.

Castings

A Well Seasoned Casting. 1 p., 1 ill. (Stuffer. The Hardinge Co., York, Pa.) Comparison of Steacy-Schmidt products and process of seasoning.

Cement Equipment

Bull Riveting Assures Maximum Strength. 1 p., 2 ill. (Stuffer. Manitowac Engineering Works, Manitowac, Wis.) Shows machine used for riveting Manitowac kilns, coolers, dryers and tube mills.

Controllers

The Wright Dynamic Lowering Circuit. 4 p., 10 ill. (Folder. The Electric Controller & Mfg. Co., Cleveland, O.) Describes and graphically illustrates the safety and efficiency of a magnetic controller for hoists.

Drills

CP Sinker Drills. 20 p., 30 ill. (Bulletin No. 850, fifth edition. Chicago Pneumatic Tool Co., New York, N. Y.) Discusses the different uses of a number of drills of this type and gives considerable data on drilling, together with practical application.

Dust Collectors

Some Dracco Dust and Fume Recovering Installations. 4 p., 1 ill. (Bulletin No. 105. The Dust Recovering & Conveying Co., Cleveland, O.) Gives a list of some plants in which these installations are operating.

Excavators

Introducing the Model 90. 4 p., 2 ill. (Folder. Speeder Machinery Corp., Cedar Rapids, Ia.) Introduces the new 1½-cu. yd. Speeder which was designed to fill a demand created by the successful operation of the ½-cu. yd. Speeder.

Sauerman News. 24 p., 42 ill. (Feb., 1930. Sauerman Bros., Inc., Chicago, Ill.) Contains a description of Beyrer Bros. sand and gravel plant at Mishawka, Ind., and includes four pages illustrating a variety of tasks that can be accomplished by slackline cableways and power scrapers.

Explosives

Permissible Explosives. 40 p., 24 ill. (Booklet printed with inks of du Pont pigments. E. I. du Pont de Nemours & Co., Wilmington, Del.) Describes and illustrates methods of testing these explosives and gives their characteristics and uses.

Grease Cups

Link-Belt Tex-Top Grease Cups. 6 p., 6 ill. (Folder No. 769. Link-Belt Co., Chicago, Ill.) Describes the Hex-Top grease cups and their application to the moving parts of industry.

Grinders

The New Eagle Grinder. 4 p., 4 ill. (Bulletin. Eagle Iron Works, Des Moines, Ia.) Is a preliminary to a large catalog, being printed, which will include full descriptions of different clay machinery.

Hoists

The Dump Truck on the Job. 10 p., 15 ill. (March, 1930. St. Paul Hydraulic Hoist Co., St. Paul, Minn.) Articles dealing with the uses of vertical and under-body hoists including considerable general information.

Idlers

The Robins Demountable Timken Bearing Idler. 4 p., 5 ill. (Folder. Robins Conveying Belt Co., New York, N. Y.) Gives information on design and uses of this Style 203 YD demountable idler.

Mills

Hardinge Conical Mills. 56 p., 100 ill. (Catalog No. 13B. Hardinge Co., Inc., York, Pa.) A comprehensive discussion of conical ball and pebble mills and their application to the field of grinding and pulverizing.

Miscellaneous

Brown Indicating and Recording Remote Type Instruments. 32 p., 59 ill. (Catalog No. 7501. The Brown Instrument Co., Philadelphia, Pa.) Deals with instruments, designed to control, record and indicate flows, pressures, liquid levels and positions.

Good Roads. 8 p., 24 ill. (Feb., 1930. Good Roads Machinery Co., Kennett Square, Pa.) Distributors' number devoted to discussing the firms and men engaged in the distribution of Good Roads equipment.

Electric Equipment for Handling Heavy Material. 26 p., 42 ill. (GEA-1232 Supersedes 48026A. General Electric Co., Schenectady, N. Y.) Describes and illustrates the application of electric power to large enterprises such as bridge cranes, unloading docks and towers.

The Labor Saver. 24 p., 38 ill. (Feb., 1930. Stephens-Adamson Mfg. Co., Aurora, Ill.) Includes a description of the Alviso plant, Alviso, Cal., and contains labor-saving information for plant operators.

Mixers, Concrete

Standard Building Mixer. 4 p., 5 ill. (Bulletin No. 124. Ransome Concrete Machinery Co., Dunnellen, N. J.) A discussion of the 28-S mixer and its application to mixing plants.

Motors

G-E Quiet-Operating Induction Motors. 4 p., 14 ill. (GEA-1231. General Electric Co., Schenectady, N. Y.) Deals with the "900 Series," riveted frame and "500 Series," skeleton frame of 2-phase and 3-phase types.

Steel, Manganese

The Amsco Bulletin. 8 p., 20 ill. (March, 1930. American Manganese Steel Co., Chicago Heights, Ill.) Gives a number of uses for manganese steel and discusses its resistance to abrasion and wear.

Amsco Manganese Steel Feeders and Pan Conveyors. 4 p., 11 ill. (Folder Section 32. American Manganese Steel Co., Chicago Heights, Ill.) Gives a history and development of this application of manganese steel to industry.

Switches

CR7006-D5 and -D7 a.c. Enclosed Magnetic Switches. 2 p., 4 ill. (GEA-19F. Supersedes GEA-19E and in part GEA-181B. General Electric Co., Schenectady, N. Y.) These switches are for a. c. 3-phase motors of maximum horsepower rating.

Tools

Electric Tools. 40 p., 124 ill. (Catalog No. 20. Black & Decker Mfg. Co., Towson, Md.) Deals with electric tools for all industries, including drills, drill stands, tool chests, saws, hammers, brushes, screw drivers, valve refacers and grinders.

Turbines, Water

De Laval Water Turbines. 16 p., 34 ill. (Publication E-1132. De Laval Steam Turbine Co., Trenton, N. J.) Describes small water turbines of the reaction, inward flow or vortex type for developing the use of water power.

Washers

Good Concrete Requires Good Aggregate. 12 p., 16 ill. (Bulletin. Eagle Iron Works, Des Moines, Ia.) Describes the Eagle gravel washers and Eagle sand washers, together with a number of original letters from satisfied operators.

Welding

The Fusion News. 16 p., 25 ill. (March, 1930. Fusion Welding Corp., Chicago, Ill.) Devoted to discussing and illustrating welding equipment and practice.

Wire Rope

The Hercules Record. 16 p., 10 ill. (March, 1930. A Leschen & Sons Rope Co., St. Louis, Mo.) Contains considerable useful information and calls attention to its Catalog No. F-25.

RECENT PATENTS

American Patents

Cars

Mine car. Warren V. Johnson, Bloomsburg, Pa., assignor to American Car and Foundry Co., New York, N. Y. No. 1,748,131.

Mine car. Harry P. Field, Berwick, Pa., assignor to American Car and Foundry Co., New York, N. Y. No. 1,748,118.

Concrete Mixing

Combination concrete-mixer turntable and subgrader. Joseph W. Heltzel, Warren, O. No. 1,749,101.

Concrete distributor. Nils M. Rosendahl, Waterloo, Ia., assignor to Construction Machinery Co. No. 1,749,230.

Machine for making uniform concrete. John F. Robb, Cleveland Heights, O., assignor to Koehring Co., Milwaukee, Wis. No. 1,750,244.

Excavating

Excavating and loading machine. John H. Blair, Chicago, Ill. No. 1,749,968.

Power-operated scraper. Harold M. Pursel, Casper, Wyo., assignor to Sharrock & Pursel, same place. No. 1,750,126.

Scraper. Leslie P. Green, Chicago, Ill. No. 1,749,741.

Teeth for excavating-dippers and the like. Walter E. Miley, Marion, O., assignor to Marion Steam Shovel Co., same place. No. 1,750,116.

Mining Machinery

Mining machine. Edward J. Doberstein, Blue Island, Ill., assignor to Goodman Mfg. Co., Chicago, Ill. No. 1,749,069.

Miscellaneous

Apparatus for tipping traveling mine skips. Walter Rawling, James Marshall and John B. Rumford, Cessnock, Australia. No. 1,749,354.

Process for determining moisture in aggregate. Robert E. Robb, Evansville, Ind. No. 1,749,606.

Foreign Patents

Cement Manufacture

Process for manufacture of ciment fondu and resulting products. R. J. Levy. French 680,762.

Process for manufacture of aluminous cement and resulting products. R. J. Levy. French 680,763.

Conveying and Transporting

Dump car. George Alexander Minetty. Canadian 297,930.

Conveyor chains. King & Co. (Leeds) Ltd. and M. Kitchin. British 325,109.

Shaker conveyors. T. G. Nyborg and M. F. Higgins. British 325,243.

Drilling

Fluid-distributing device for percussive hammers and similar apparatus. Etablissements Francois Soc. Anon. British 325,292.

Fluid-pressure tools. Chicago Pneumatic Tool Co. British 312,929.

Percussive tools. F. Babcock and R. W. H. Kane. British 325,292.

Rock drills and like fluid-pressure operated tools. G. H. T. Rayner and P. Rayner. British 324,958.

Steel retainer for rock drills. W. W. Triggs (Ingersoll-Rand Co.) British 325,433.

Excavating

Dredging apparatus for raising wet or dry material. Krupp Grusonwerk Akt.-Ges. British 314,851.

Grab bucket. W. Kaltenbach. Canadian 297,921.

Scraper excavator. Luebecker Maschinenbau Gesellschaft. German 493,577.

Grinding and Crushing

Grinding and screening mill. J. Gras. French 680,683.

Grinding mill. Alfred Erasmus Geoffrey MacCallum. Canadian 297,721.

Improvements in the construction of grinding equipment. A. E. G. MacCallum. French 680,967.

Improvements in gyratory crushers. Nordberg Mfg. Co. French 681,260.

Improvements in grinding mills. Allis-Chalmers Mfg. Co. French 680,766.

Kilns

Continuous kilns of the Hoffman type. F. Novelli. British 309,547.

Continuously operating device for drawing shaft kilns. Isai Isserlis. German 493,668.

Mechanically operated roller grate for shaft kilns. Frederico Graf. German 493,842.

Rotary kiln for the production of fused cement. Arno Andreas. German 493,841.

Miscellaneous

Gravel spreader. William George Smith. Canadian 297,483.

Hoisting bucket for concrete. Theodor Wagener. German 493,983.

Plant for washing, drying and chemically treating granular and crystalline materials. Thomas Owston Wilton and Norman Wilton. Canadian 297,871.

Production of calcium aluminate. Johan Alexander Bonthron and Ture Robert Haglund. Canadian 297,880.

Mixers

Concrete mixer. Karl Piehler. Canadian 297,939.

Improvements in concrete mixers. P. M. Richier. French 680,531.

Mixing systems. Fuller Co. French 680,539.

Screening

Concentrating screen. Societe Generale de Mines et Metallurgie. French 681,014.

Driving mechanisms for vibrating sieves or like apparatus. Amme-Luther Werke Braunschweig der Miag Muehlenbau Und Industrie A. G. British 313,086.

Self-operating brushes for the cleaning of flat reciprocating sieves. Geb. Buehler. British 314,394.

PIT AND QUARRY will furnish, at its actual cost, a copy of any patent cited above. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and by addressing the Commissioner of readers may procure a copy directly requested. Postage stamps are not Patents, with payment for copies accepted by the Patent office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is theer a fixed charge per copy.

PERSONAL MENTION

William G. Hudson has been appointed as district engineer for the Portland Cement Association. He will be in charge of association work in the states of Louisiana and Mississippi with offices in the Hibernia Bank Building, New Orleans, Louisiana. Mr. Hudson has been a member of the field staff of the New Orleans office since June 1, 1923, resident at Shreveport. He is a native of Tennessee, was educated in that state, and is well known in the building industries of Louisiana and Mississippi.

O. H. D. Rohwer, heretofore division sales manager of the Universal Atlas Company, was appointed an assistant general sales manager, with office at the Chicago headquarters. **A. C. Cronkrite,** who has been assistant general sales manager, continues in that position. The new appointment is due to the increased business caused by the joining of the Universal and Atlas organizations. Mr. Rohwer for twenty years was connected with the Universal company. Starting in the St. Louis office in 1907, he was successively salesman, special representative on contract work, special representative in Kentucky and in Detroit, and division sales manager with territory in Wisconsin, Iowa, Kentucky and Tennessee.

N. A. Kelly, previously sales manager at New York for the Universal company, was appointed to the same position with the enlarged organization. He was associated with the sales department of the Universal company for eighteen years. He began in 1911 as sales representative in New York state, working out of the Pittsburgh office. In 1916 he was named division sales manager in charge of the company's sales force in New York and other eastern states. In 1929 he was made sales manager at New York with supervision of sales in eastern territory.

A. O. Stark, appointed assistant sales manager at New York for the Universal Atlas company, was connected in a sales capacity with the former Atlas company for more than twenty years. As assistant eastern sales manager and export manager for Atlas, his activities were chiefly in eastern territory and in foreign fields. Prior to the war he was placed in charge of the exportation of Atlas products and since that time continued his supervision of export activities.

William A. McIntyre, for eleven years a sales executive for the Atlas company and experienced both in engineering and in selling, has been appointed to direct the sales forces working out of Philadelphia for the Universal Atlas company. He is a graduate in engineering from the University of Pennsylvania. He was engineer for the United States war department in dredging the Delaware river and New York harbor. As secretary of the committee on portland cement during the war he handled all government allocations of cement. From 1912 to 1916 he was chief road engineer for the Portland Cement association. Since 1919 he has been engineer and manager of the Philadelphia office of the former Atlas company.

E. R. Norris has been appointed assistant to vice-president, according to an announcement issued by **J. S. Tritle,** vice-president in charge of manufacturing of the Westinghouse Electric and Manufacturing Company. Mr. Norris, formerly General Works Manager, will now be responsible for all plant facilities of the Company, manufacturing methods, cost reduction and inspection. Mr. Norris has been associated with the Westinghouse Company since 1892.

Roger Sherman and **James H. Ferry,** both of Chicago, were elected vice-presidents of the organization at a recent meeting of the Board of Directors of the Continental Motors Corporation. Both men have, for a number of years, been members of the board.

Roger Sherman is a member of the law firm of Tenney, Harding, Sherman and Rogers and has been president of the Illinois Bar Association, and has also served as president of the Chicago Bar Association. For several years he was master of the Chancery Court of Chicago.

Jas. H. Ferry has been associated with Continental Motors for many years as a member of the board and is one of its largest individual stockholders. At the same meeting of the board **B. F. Tobin, Jr.,** was elected treasurer of the company. Mr. Tobin has been connected with Continental since he left college. He has been assistant secretary, secretary and member of the board of directors.

A. J. Hoskin is chairman of the committee on non-metallic minerals, Chicago section, American Institute of Mining and Metallurgical Engineers.

Frank E. Guy has been appointed traffic manager of the Universal Atlas Cement Company, Chicago, it was announced recently. He was formerly eastern traffic manager, located at Pittsburgh, for the Universal Portland Cement Co. Mr. Guy's headquarters will be at Chicago.

W. E. Randolph has been appointed as assistant traffic manager with headquarters at Pittsburgh. Mr. Randolph has been with Universal-Atlas for 22 years and was assistant to Mr. Guy when the latter held his previous position.

Charles H. Gaut, who for a number of years has been connected with the American Zinc, Lead & Smelting Company and its subsidiary the American Limestone Company of Mascot, Tennessee, has been appointed to represent the Nordberg Manufacturing Co. both on service and sales in the territory south of the Ohio River. His permanent address is Fountain City Post Office, Knoxville, Tennessee.

Cyril Ainsworth, formerly director of the Bureau of Industrial Standards of the Pennsylvania Department of Labor and Industry, has been appointed to direct the national safety code work of the American Standards Association, according to an announcement by **William J. Serrill,** president of the A. S. A. Mr. Ainsworth will direct the work of the Association in the establishment of national codes for the guidance of state and municipal governments, industrial organizations and insurance companies.

John Wilson McNair, formerly of the standards department of the American Institute of Electrical Engineers, and Clarence Edward Darling, formerly of the staff of the American Society of Mechanical Engineers, were appointed to the A. S. A. staff. These appointments are part of a program of extension of national industrial standardization activities, which follows the recent refinancing of the A. S. A. As a result of this refinancing, the association will have nearly $500,000 available for its work during the next three years.

F. L. Stone, general sales manager of the Universal Atlas Cement Company, a subsidiary of the United States Steel Corporation, has announced the following appointments to the sales department:

O. H. D. Rohwer, heretofore division sales manager of the Universal Atlas Company, is appointed an assistant general sales manager. **A. C. Cronkrite,** who has been assistant general sales manager, continues in that position. The new appointment is due to the increased business caused by the joining of the Universal and Atlas organizations. Mr. Rohwer for twenty years was connected with the former Universal Portland Cement Company. Starting in the St. Louis office in 1907, he was successively salesman, special representative on contract work, special representative in Kentucky and in Detroit, and division sales manager with territory in Wisconsin, Iowa, Kentucky and Tennessee. Before going to Universal he was with the Missouri Pacific railroad for ten years in various departments. A considerable part of this time was spent in a selling capacity in the railroad coal department. During part of this period he also was general agent in New Orleans for the American Refrigerator Transit Company, which was affiliated with the Missouri Pacific. In addition to his selling experience in the cement and coal fields, Mr. Rohwer for three years was in the sales departments of powder companies controlled by the DuPont and Peabody interests. In his new position, as assistant general sales manager, Mr. Rohwer will have his office with the headquarters of the Universal Atlas Company in Chicago.

N. A. Kelly, previously sales manager at New York for the former Universal Portland Cement Company, is appointed to the same position with the enlarged organization. He was associated with the sales department of the Universal Company for eighteen years. He began in 1911 as sales representative in New York state, working out of the Pittsburgh office. In 1916 he was named division sales manager in charge of the company's sales force in New York and other eastern states. In 1929 he was made sales manager at New York with supervision of sales in eastern territory. With his long experience and many contacts in eastern markets, Mr. Kelly is well fitted to direct the enlarged sales operations in that area that results from the union of the former Universal and Atlas organizations.

A. O. Stark, appointed assistant sales manager at New York for the Universal Atlas Company, was connected in a sales capacity with the former Atlas Company for more than twenty years. As assistant eastern sales manager and export manager for Atlas, his activities were chiefly in eastern territory and in foreign fields. Prior to the war he was placed in charge of the exportation of Atlas products and since that time continued his supervision of export activities. He has traveled extensively in Latin American countries and is familiar with foreign trade conditions as well as enjoying a wide acquaintance in the domestic construction industry.

William A. McIntyre, for eleven years a sales executive for the former Atlas company and experienced both in engineering and in selling, has been appointed to direct the sales forces working out of Philadelphia for the Universal Atlas Company. He is a graduate in engineering from the University of Pennsylvania. He was engineer for the United States war department in dredging the Delaware river and New York harbor. As secretary of the committee on portland cement during the war, he handled all government allocations of cement. From 1912 to 1916 he was chief road engineer for the Portland Cement Association. Since 1919 he has been engineer and manager of the Philadelphia office for the former Atlas Company.

W. U. Vinton, formerly assistant conservation engineer of the Portland Cement Association, has been appointed acting manager of the conservation bureau of the Association. Mr. Vinton succeeds Harry W. Newton, resigned, who is now associated with the Nordberg Manufacturing Co.

Myram Hance Hammond, vice-president of the Great Lakes Portland Cement Corporation, Buffalo, N. Y., passed away suddenly Wednesday, March 5, 1930. He was prominent among operators in his industry, and had a wide experience both in construction and operation of cement plants. He was connected with projects in Argentine and Cuba, and with domestic operations at Iola, Kan., Dallas, Tex., and Greencastle, Ind. He moved to Buffalo when the Great Lakes company erected its new plant at that city.

Frank Alonzo Wilder, 69, of North Holston, Va., died March 7, 1930, after several years of illness. He founded and for many years served as president of the South Gypsum Company, and was a member of the Geological Society of America, the American Association for the advancement of Science, and the Society of Economic Geologists.

Joseph Lang died March 7 in a hospital at Englewood, N. J., where he had been a patient since December 9, when he underwent an operation from which he was well on the way to recovery when pneumonia developed and resulted in his death. Funeral services were held Sunday, March 9, at his late residence, 177 Lakewood Ave., Leonia, N. J. Interment was at his old home, Franklin, N. J.

"Uncle Joe," as he was familiarly known, was the dean of the New York sales organization of the Explosives Department of E. I. duPont de Nemours & Company, and would have rounded out his 47th consecutive year with the company on March 17. He observed his 75th birthday on February 8. He was born in Devonshire, England, but came to America when but ten years of age. Until two years ago, Mr. Lang continued to handle the entire work of his territory and was still active in the selling of explosives until shortly before he entered the hospital.

Frank M. Williams died in Albany, N. Y., Feb. 20, at the age of 56, when the State and Nation lost one of its most able and experienced engineers. He graduated from Colgate University in 1895, became a lawyer and then an engineer. He was elected state engineer for five terms and is best known as the builder of the Barge Canal. He was a member of the Holland Tunnell Commission and engineered many big projects both public and commercial. At the time of his death he was engaged in preliminary work on the proposed Nicaragua Ship Canal as a member of the Commission of Engineers appointed by President Hoover last June.

Herman E. Neal, president of the Neal Gravel Company and prominent in the civic life of Mattoon, Ill., died at his home, March 3, 1930, of heart trouble. He was born at Jasonville, Ind., in 1881. With his brother, B. E. Neal, he organized the present gravel company in 1904. He was a director of the National Bank of Mattoon and of the U. S. Grant Hotel Co., and held memberships in Masonry, Rotary Club, Mattoon Country Club and Central Community church.

Leonard Bales, one of the pioneers of the crushed stone industry in the Middle West, died of pneumonia on March 3 at the age of 77. Mr. Bales started in the stone business about 40 years ago, operating a quarry and plant at La Grange. He later opened another quarry and entered the contracting field. A son, M. M. Bales, is superintendent of the Elmhurst-Chicago Stone Company at Elmhurst, Ill.

FINANCIAL NEWS
CORPORATE & BUSINESS

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

Penn-Dixie Suffers From Low Prices

The report of Pennsylvania Dixie Cement Corp. and subsidiaries for the year ended December 31, 1929, shows net profit of $332,268 after depreciation, depletion, interest, federal taxes, etc., equivalent to $2.44 a share on $13,588,800 preferred 7 per cent stock. This compares with net profit of $1,293,851 equal after preferred dividend requirements to 90 cents a share on 400,000 no-par shares of common stock in 1928.

Blaine S. Smith, president, pointed out that construction contracts awarded in 37 eastern states were 13 per cent less in 1929 than in the previous year and cement consumption in 1929 was less than in any year since 1926.

Continuing, Mr. Smith said: "The decline in selling prices during the last five years culminated in a drastic reduction last August of 20 cents to 30 cents a barrel in the territories where we operate. On September 30, 1929, the price received was 52 cents a barrel less than the average price received for the four years preceding 1927. However, during the past few weeks, selling prices have practically recovered the loss of the early fall, the greatest improvement being in the Southwest where our earnings had been most seriously affected."

Economy of operations has been maintained. Notwithstanding reduced production, manufacturing costs were slightly less in 1929 than in 1928, and lower than for any previous year. Plants have been maintained in good condition, and adequate depreciation and depletion charges were made during the year, amounting to $1,395,915.

Sinking fund requirements in 1929 were fully met, and in addition, $225,000 par value of first mortgage bonds were purchased in anticipation of 1930 sinking fund.

On April 1, 1929, possession was obtained of the Pyramid plant at Des Moines, Iowa, which was purchased previously by the company at receiver's sale.

The balance sheet as of December 31 last, continued to reflect good condition. Cash amounting to $2,987,264 was nearly double that of a year ago. Accounts and notes receivable were considerably reduced and inventories were much lower than in 1928, while current assets were equal to about one-half of outstanding bonds.

Commenting on conditions of the cement industry, President Smith says: "Imported cement, duty free, continues to seriously affect our profits from sales into seaboard territories where this competition forces us to sell below cost. The pending tariff bill as it passed the House carried a duty of 8 cents per hundred pounds, which was concurred in by the finance committee of the Senate. However, on January 31, 1930, the Senate voted to leave cement on the free list. Figures put out by the United States Tariff Commission show that the difference between cost of foreign cement at seaports and domestic cost of production, plus freight at seaports and imputed interest, varies from 30 cents per barrel at New York City to 87 cents per barrel at Charleston, S. C., in favor of the foreign product.

"Authorities generally agree that the lessened stock market demand for funds has had and will continue to have a favorable effect on construction generally by furnishing more and cheaper credit. While marked improvement may not occur for a few months, if reliable surveys and forecasts can be accepted, indications are for increased cement consumption later in the year from which we expect our company to benefit. Enlarged highway programs in certain states, augmented by increased appropriations for federal aid constitute an additional favorable factor. With this improved demand, with the higher levels now prevailing, although full benefit of this will not be felt until after contracts on the books taken at lower levels are shipped, and with the lowest manufacturing costs in our history, increased earnings in 1930 may be expected."

CURRENT DIVIDENDS

COMPANY	CLASS OF STOCK	DIVIDEND RATE	HOLDERS OF RECORD	PAYABLE
Alpha Portland Cement	Preferred	1¾% qr.	Mar. 1	Mar. 15
American Aggregates Corp	Preferred	1¾% qr.	Mar. 20	Apr. 1
Assoc. Portland Cement Mfrs., Ltd	Am. Dep.	8%	Mar. 17	Apr. 1
Boston Sand and Gravel	Preferred	$.87 qr.	Mar. 22	Apr. 1
Boston Sand and Gravel	Common	$.40 qr.	Mar. 22	Apr. 1
Calaveras Cement Co.	7% Pfd.	1¾% qr.	Mar. 30	Apr. 15
Canada Cement	6½% Pfd.	1⅝% qr.	Feb. 28	Mar. 31
Canada Gypsum and Alabastine	New stock	$.37½ qr.	Mar. 14	Apr. 1
Cleveland Builders Supply	Common	$.50 qr.	Mar. 15	Apr. 1
Consolidated Oka Sand and Gravel	Preferred	1¾% qr.	Mar. 27	Apr. 1
Consumers Co	Pr. Pfd.	$1.50 qr.	Mar. 15	Apr. 1
Coronet Phosphate Co	.....	$2.00 qr.	Mar. 14	Apr. 1
Dolese and Sheperd	.....	$2.00 qr.	Mar. 20	Apr. 1
Duffern Pav. and Crushed Stone	7% Pfd.	1¾% qr.	Mar. 17	Apr. 1
General Asphalt	Common	$1.00 qr.	Feb. 28	Mar. 15
Ideal Cement Co	Common	$1.75 qr.	Mar. 13	Apr. 1
Illinois Brick	.....	$.60 qr.	Apr. 1	Apr. 15
International Cement	Common	$1.00 qr.	Mar. 11	Mar. 28
International Salt	.....	1½% qr.	Mar. 16	Apr. 1
Johns Manville	Preferred	$1.75 qr.	Mar. 11	Apr. 1
Johns Manville	Common	$.75 qr.	Mar. 25	Apr. 15
Kentucky Rock Asphalt	Common	$.40 qr.	Mar. 15	Apr. 1
Laclede Clay Products	Preferred	1¾% qr.	Mar. 29	Apr. 1
Lawrence Portland Cement	.....	1% qr.	Mar. 14	Mar. 30
Lehigh Portland Cement	Preferred	1¾% qr.	Mar. 14	Apr. 1
Limestone Products	7% Pfd.	1¾% qr.	Mar. 15	Apr. 1
Leslie Calif. Salt	Common	$.56 qr.	Mar. 1	Mar. 15
Medusa Portland Cement	Preferred	1½% qr.	Mar. 25	Apr. 1
Medusa Portland Cement	Common	$1.50 qr.	Mar. 25	Apr. 1
Metropolitan Paving Brick	Preferred	$1.75 qr.	Mar. 15	Apr. 1
Mineral Products Co	Pfd. "A"	$.20 qr.	Mar. 30	Apr. 1
National Brick of Laprarie	Preferred	$.75 qr.	Feb. 28	Mar. 15
Newago Portland Cement	Preferred	$1.75 qr.	Mar. 26	Mar. 31
New York Trap Rock	Preferred	$1.75 qr.	Mar. 20	Apr. 2
Peerless Cement	Preferred	$1.75 qr.	Mar. 20	Mar. 31
Pennsylvania Salt	Common	$1.25 qr.	Mar. 30	Apr. 15
Raybestos Manhattan	Common	$.65 qr.	Feb. 28	Mar. 15
Santa Cruz Portland Cement	.....	$1.00 qr.	Mar. 24	Apr. 1
Sterling Salt	Common	$.50 qr.	Mar. 24	Apr. 1
Superior Portland Cement	Class A	$.27½ M.	Mar. 18	Apr. 1
Texas Gulf Sulphur	.....	$1.00 qr.	Mar. 3	Mar. 15
United States Gypsum	Preferred	$1.75 qr.	Mar. 15	Mar. 31
United States Gypsum	Common	$.40 qr.	Mar. 14	Apr. 1
Warner Co	1st Pfd.	$1.75 qr.	Mar. 14	Apr. 1
Warner Co	Common	$.50 qr.	Mar. 30	Apr. 15
Worcester Salt Co	Common	1¼% qr.	Mar. 24	Mar. 29

LEGAL INFORMATION FOR OPERATORS

Reason for Workmen's Compensation Laws

In accordance with the trend of modern protective procedure, almost all states have adopted laws requiring corporations, and individuals who employ several persons, to perform certain legal duties, such as submitting detailed reports to the state officials of the number of regular employees, the duties of such employees, the salary earned by each employee, and other information. In many instances, the employers are required to contribute to a fund set aside for compulsory payment of compensation to injured employees.

For example, in Maryland Casualty Co. v. State Industrial Commission, 282 Pac. 293, it was disclosed that an employee in a quarry was injured by explosion of dynamite. One of his eyes was put out and the vision of the other was impaired. Litigation developed when the employer contended that he should pay the amount of compensation specified by the law for "partial loss of vision." The Court held payment should be increased on the basis of total loss of one eye and partial loss of the other eye, stating the following important law:

"It must be borne in mind that the Workmen's Compensation law is remedial in character and intended to cure defects existing in former laws and should, at all times, be broadly and liberally construed so as to effectuate its purpose."

Employer Liable for Injury Caused By Defective Tool

It is the legal duty of an employer to provide as reasonably safe working place as the circumstances will permit. Furthermore, he is legally bound to exercise care to know that the premises, machines, tools and appliances are free from defects which are likely to cause injury to the employee.

On the other hand, an employer is not an "insurer" against injuries sustained by his employees. In other words, if it can be shown that an injured employee was grossly negligent in not taking the proper precautions to protect himself against injury, or that the defect causing the injury was not discoverably by a reasonably careful employer.

For illustration, in Bryant v. Burns Co., 150 S. E. 122, an employee, who was seriously injured by an electric shock received when he was operating an electric tool, sued his employer for damages. Since the employee could not be expected by a reasonable employer to discover the defect, and also because the law requires an employer to regularly inspect dangerous tools, the Court held the employer liable.

Statements in Court Are Privileged

Many persons who file suits against other persons are disinclined to state facts because of fear that the party being sued may file a libel suit. However, it is important to know that only under exceptional circumstances is a person liable in damages for accusations made in law suits.

For instance, in Irwin v. Newby, 282 Pac. 810, a man named McAlvay obtained a judgment for $16,000 against a man named Stockwell, who was the owner of stock in the Consumers' Salt Company. His stock was sold by a sheriff's sale to satisfy this judgment. Stockwell then sued McAlvay alleging that the latter fraudulently proceeded with "said pretended sheriff's sale" with the intent and purpose of "robbing" him of his interest in two hundred twenty-five thousand shares of the capital stock of the Consumers' Salt Company "as the price and award for a successful conspiracy."

McAlvay sued Stockwell for damages alleging that this statement was untrue and libelous. Since statements of this nature are deemed privileged communications, the Court refused to hold Stockwell liable and said:

"As to the degree of relevancy or pertinency necessary to make alleged defamatory matter privileged, the Courts favor a liberal rule. The matter to which the privilege does not extend must be so palpably wanting in relation to the subject-matter of the controversy that no reasonable man can doubt its irrelevancy and impropriety. . . . It must, however, be legitimately related thereto, or so pertinent to the subject of the controversy that it may become the subject of inquiry in the course of the trial."

What Is Legal Day's Work?

In almost all states eight hours is a legal day's work. Therefore, in Brookfield Quarry Co. v. Brewster, 281 Pac. 14, the Court held twenty consecutive hours employment constituted two and one-half day's work. In this case it was disclosed that a person hired a dredge to tow a barge of gravel on the basis of a rental of $65 a day. Twenty hours time was required to tow the gravel to the delivery point and the owner of the dredge demanded payment of $162.50 on the basis of two and one-half days time, figuring a day as eight hours. The hirer refused payment and contended that, since the owner of the dredge had failed to explain that eight hours were to be counted as a day, he owed for less than one day's work at $65 per day. However, since eight hours is customarily considered a legal day's work in the locality in which this work was performed, the higher court held the owner entitled to recover $162.50.

Marble Company Held Liable For Heavy Damages

The advisability of the high degree of care required of materialmen, who deliver non-metallic products for building construction purposes, is well illustrated in the case of Shaw v. Vermont Marble Co., 147 Atl. 923.

In this case it was disclosed that the Vermont Marble Company was engaged in moving large pieces of marble, weighing 1,000 pounds and upward, from the ground to the ninth floor of a new building. The pieces were moved by means of an elevator, but being too large to be placed in the usual manner on the platform of the elevator, they were placed thereon in a diagonal position. At each floor a plank had been placed so that laborers, in wheeling building material from the elevator, would not break the concrete flooring. Thirteen pieces of marble had been hoisted when, as the elevator reached the sixth floor, it struck one of the boards and dislodged a piece of tiling which fell down the shaft, injuring a workman. He sued the marble company for damages as a result of the injury. The latter introduced testimony showing that the principal contractor had installed the tiling which caused the injury. However, since the accident was caused by negligence of the marble company's employees, the lower Court held the latter liable for $18,500 damages. The higher Court sustained this verdict, saying:

"He sued for such injuries as he received, and has a verdict for $18,500. This verdict we are asked to set aside, because it is against the weight of evidence, and there is no evidence of negligence, and finally because it is excessive. We conclude that the proofs do not warrant us in setting aside the verdict for any of these reasons."

INSURANCE PROBLEMS DISCUSSED

Windstorm Insurance

"Why do I need windstorm insurance? I can't start a cyclone."

This is one of the oldest jokes in the insurance business—the answer of the property owner of doubtful morals who is liable to start a fire when business is poor and who never buys insurance unless he sees a chance for profit.

From that point of view there is not much to windstorm insurance. The property owner cannot start a wind; nor can he prevent it. And he cannot lessen the damage which wind may do except through erecting more substantial buildings more firmly anchored to the ground.

Heavy winds are greatly feared in some sections of the country and practically ignored in others. Probably both attitudes are exaggerations. We discount the chance of wind damage entirely until a tornado makes the front page of the newspapers, and even then our thinking on the subject is likely to be unscientific.

No Tornado Season

In most states of the Union the common attitude is that Florida and Kansas have a natural monopoly on all the severe winds that blow in this country. It is true, of course, that these two states do suffer frequent losses. It is also true, however, that every one of the forty-eight states averages at least one tornado a year, and that while early spring is looked on as the big "tornado season," the records show tornadoes in every month.

Windstorm damage is the most general property risk in the country except fire. Insurance against it is widely carried, but the policies are often inadequate in amount or form because of some misunderstanding of the characteristics of winds. In the first place, one should note that the so-called windstorm or tornado insurance policies cover direct damage of all sorts. They do not specify the required intensity of the wind. If a summer breeze is sufficient to blow down part of your building, the loss is covered just as much as if the damage was done by a full tornado or cyclone. For that reason the insurance is better understood if you give it the modern name of "windstorm insurance" rather than the more limited old name of "tornado insurance."

Freak Losses

What happens when a heavy wind blows through a certain district is always a very interesting study. The cyclone especially has given the newspapers a lot of freak human interest stories. It is well known that a cyclone may wreck one farm, then jump above the ground for a mile or so, only to descend again to wreck other property. Although other winds follow more regular habits than cyclones, they are just as interesting to study and just as terrifying to witness.

Any direct wind of more than normal intensity, whether you dignify it by the name of tornado or not, has a double action which bears on our insurance problem. The first symptom we have is the direct blow—a straight-away force of wind which will push over flimsy frame sheds and do minor damage to more substantial buildings, such as tearing off corners of roofs, blowing in windows, or felling trees on to buildings with some resulting damage. This we can understand and most people insure their property in proportion to the probable damage of this sort.

Buildings Explode

A secondary effect of the wind, however, is even more serious. The direct force of the wind creates compressed air, naturally, in all the buildings in its path. Just after the main force has passed there follows a comparative vacuum. The air inside the buildings at this moment is under much heavier pressure than the air outdoors, and in this instant of unequal pressure buildings literally explode because of the heavy compression inside the walls. In the last great tornado which crossed the path of a large city it was noteworthy that most of the buildings damaged were of modern construction with heavy brick walls and that they "blew up" so completely from this internal explosive force after the wind had entirely passed them that they were flattened to the ground.

It is evident from statistics that neither the district where you are located, the season of the year, nor the construction of your building can give you immunity from windstorm loss.

Supplements Fire Policies

Another fact about wind insurance of general interest is that you really do not have full fire insurance unless you also carry windstorm protection. Suppose you own a substantial brick building in a region which has not recently been visited by a tornado. Your broker would have a hard time convincing you that there was much chance of that building being blown to the ground. However, you would of course agree that a fairly heavy wind might come along any day and rip off a corner of the roof or blow in a little piece of wall, and that as a result fire might start from crossed electric wires or an overturned lamp, burning the building completely. You might assume fairly in that case that the wind policies ought to pay for the small direct damage and that the rest was a fire loss. Unfortunately, if you will turn to those little lines of fine print which we never read on the inside of your fire policies, you will learn that "should the building, or any part thereof, fall, except as a result of fire, all insurance shall immediately cease." In other words, as soon as the piece of roof or wall fell in, your fire insurance is automatically canceled and you cannot collect a dime under it for subsequent fire loss. This line in the standard policy is not intentionally a "joker." It was originated to protect insurance companies against liability for buildings that had collapsed from structural weakness, but by legal interpretation it necessarily works a hardship on these cases of combined fire and wind destruction. Recognizing the injustice of a situation where a man might carry both fire and wind insurance and still fail to collect in full on a loss, the insurance companies inserted a clause in the wind policies which they have called "bridging the gap." They are unable to change the standard fire policy because it has stood up under years of court decisions and no one cares to tamper with it. So they have made the change in the windstorm policy. Without increasing the rates at all, the wind policies will now pay for resulting fire loss, and it may be said that every property owner should carry windstorm insurance in full merely in order to complete his fire coverage.

Windstorm insurance also brings up some questions of borderline cases where property is damaged jointly by wind and rain or hail. These cases, together with some recommendations as to the best policy forms and other technical points will be discussed in the next article in this department.

REVIEW OF FOREIGN PRACTICE

Properties of Various Forms Of Asbestos

Chrysotile asbestos (7 samples), amphibole (3 samples), crocidolite and amosite were examined by X-rays in the fresh condition, after heating to 900 deg. C, and after heating with concentrated hydrochloric acid. In the acid treatment the chrysotiles lost more than 50 per cent of their weight, and X-rays showed a complete disintegration of their fibrous structure. The other samples showed smaller losses in weight and they retained part of their fibrous structure. On heat treatment the chrysotiles suffered high losses in weight, but in some cases their structures were less affected than those of certain of the amphiboles. It was possible to distinguish the various samples by the extent that they differed in behavior. —Clark and van Orden (*Kautschuk, 5*, 28-35, 1929 and B. C. A.).

Geology of the Couzon Quarries Near Lyons

The Couzon quarries on the Mont-d'Or near Lyons (Rhone), France, at present furnish raw material for a cement factory, and for nearly a century have provided the Lyons region with stone for various building purposes. The quarries lie on the right bank of the Saone river about 12 km. above Lyons, and the largest of them are cut in the front and the south side of a huge rocky promontory from the Jurassic formation of the Mont-d'Or. The lower portion of the deposit is a commercially unimportant marly limestone. Above this lies 60 m. (195 ft.) of limestone of 90 to 95% purity that is the stone which has been quarried for building purposes. Above this lies several inches to a foot of red clay, and finally above this lies a thick deposit of blue stone known as Ciret, which has no value in construction because of its decomposition when exposed to weathering. This stone was of insignificant thickness and was easily stripped off when quarrying was begun, but its thickness rapidly increases as the quarries are cut back into the hill and its total height must be 150-160 m. (485-520 ft.). At that time Charles Deperet, made a thorough chemical and geological investigation of the Couzon quarries, calling attention to the value of the Ciret as raw material for hydraulic lime or portland cement. The beginning of cement manufacture from this stone (which has also made it possible to proceed with the quarrying of the limestone below) was influenced to great extent by this report, which is published in full and forms the greater part of this article.—J. Deforge in *Revue des Materiaux de Construction* (Paris) No. 241, pp. 373-7, Oct. 1929.

Chemistry of the Setting of Portland Cement

In a recent article in *Gewapend Beton* (Amsterdam) (18:1-6, Sept. 1929), Prof. Van Nieuwenburg of the Technical College of Delft reviews the present sum of our knowledge of the setting of portland cement and the views most commonly held today, with the comment that this question cannot be definitely settled until we know exactly the constitution of portland cement clinker. The little that is definitely settled is that the aluminates are the first and the silicates the last to react; that gels are formed either directly or via crystalline products, and that $Ca(OH)_2$ probably is formed in crystalline form as a by-product. The varying views on the constitution of portland cement clinker are summarized as follows:

Rankin		Jaenecke	Dyckerhoff
Ideal P. C.	Commercial P. C.	Principally	Principally
$3CaO.SiO_2$ $2CaO.SiO_2$	$3CaO.SiO_2$ $2CaO.SiO_2$	$8CaO.Al_2O_3.2SiO_2$	$(B2CaO.SiO_2+CaO)$
$3CaO.Al_2O_3$	$5CaO.3Al_2O_3$		then $3CaO.Al_2O_3$ $5CaO.3Al_2O_3$ $(3CaO.SiO_2)$

Steam Curing of Portland Cement Mortars

In the July issue of the recently-founded *Canadian Journal of Research* (Ottawa) (vol. 1, pages 148-154), T. Torvaldson of the University of Saskatchewan and G. R. Shelton of the North Carolina State College report on a study of the steam curing of portland cement mortars in saturated steam at 100, 125, 150, 175 and 200 deg. C., both as to variations in the tensile strength of 2-day and 28-day mortar briquets and as to the changes which occurred in the crystalline matter in the cement. The rate of hydration of the cement, as shown by the disappearance of the original crystalline material, increased with the temperature of the saturated steam. Crystals of calcium hydroxide appeared almost at once, but after reaching a maximum decreased again in amount. At the same time, a new crystalline product appeared and increased in quantity as the amount of the hydrated lime decreased. Some of the chemical properties of the new crystals are given. The fact that the hexagonal crystals of hydrated lime disappear as the new crystals are formed suggests that the latter might be another crystalline modification of hydrated lime. This is unlikely, however, for when the crystals are decomposed by dilute hydrochloric acid, an insoluble skeleton of the crystals remains. When sulphuric acid is used, a large amount of gypsum is formed, showing that the crystals are rich in lime. The stability of the new crystals when exposed to solutions of sulphates indicates that the great increase in the resistance of portland cement mortars to alkali action produced by steam-curing is connected with the production of this crystalline material.

Trass as an Admixture in Cement Concrete

Trass is a volcanic earth material similar to puzzolana, used to a considerable extent in such countries as Germany, Holland, Belgium and Sweden as a constituent of portland cement concrete, and it is said that hardly any concrete structure of any size in Germany is erected without some use of it. Conflicting views are held concerning its exact effect on strength, density, and the like, and in this article the author reviews the literature on the subject and the results on some large jobs now being carried on. His conclusions are that trass increases, rather than decreases, the strength of the concrete; that it improves the concrete's elasticity and resistance to shocks and blows; that considerably increases the concrete's density; that it is a noticeable factor of safety for concrete in sea water and salt water; that the adherence of such concrete to the reinforcing steel is the same as that of ordinary concrete, and that rusting of the reinforcing steel is not a consequence of the use of trass.—R. Wagner in *Gewapend Beton*, Amsterdam, 17:181-188, June, 1929.

LATEST NEWS FLASHES

Calcium Carbonate Merges Ground Limestone Interests

Calcium Carbonate Corp., Marlon Brando, manager, 520 N. Michigan Ave., Chicago, Ill., recently reported as having merged several limestone companies, has not acquired the entire holdings of any of the companies, but has merged only the ground limestone interests of the producers involved. The companies, each of which retains its name, are: Western Limestone Products Co., Omaha, Nebr.; Independent Gravel Co., Joplin, Mo., with plants at Carthage, Webb City and Racine, Mo., and Picher, Okla.; Carthage Crushed Limestone Co., Carthage, Mo.; Peerless White Lime Co., St. Louis, Mo., with plant at Ste. Genevieve, Mo.; Reliance Whiting Co., Alton, Ill.; and Black White Limestone Co., Quincy, Ill.

Southern Lime Products to Build Plant

Southern Lime Products Co., Cordele, Ga., is building a new 250-ton per hr. crushing plant near Cordele. Chas. C. Steward Machinery Co., Birmingham, Ala., which designed the plant, will build and furnish all equipment except crusher, which is a Williams hammer mill. Operation is expected to begin April 1.

Building New Plant in Mexico

La Tolteca Cia. de Cemento Portland, S. A., G. H. E. Vivian, managing director, Mexico City, Mex., will begin the construction of a 2,000-bbl. per day cement mill near there within a few months. The mill which this company has been operating for many years will be closed and modernized as soon as production at the new mill begins.

Company to Develop Texas Potash Deposit

Production of potash on an extensive scale will be started soon in the Midland area of West Texas by the Texas Potash Corporation of Dallas, as a result of the discovery by Dr. E. P. Schoch, director of the bureau of industrial chemistry at the University of Texas, of a method for refining polyhalite ores, according to the *Goldfield News*, Nevada.

"The potash deposits found in the Permian of West Texas are chiefly composed of polyhalite—a mineral made up of the sulphates of potassium, magnesium and calcium," Dr. Schoch says. "This is the first compound of potassium which separates from sea water when the latter undergoes evaporation. Many of the beds of this mineral found in West Texas are composed of practically nothing but this mineral; that is, they are practically free from chlorides.

"These potash deposits are entirely different in composition from the European potash deposits. The latter are mainly composed of minerals which were formed from prior deposits of polyhalite through a process of resolution and recrystalization; these secondarily formed minerals contain chlorides in prepondering amounts, and they are quite soluble in water.

"Polyhalite, however, is only slightly soluble in water, and this fact naturally appeared as a hindrance to the refining of this mineral because the process of refining requires the dissolution of the minerals to be refined.

"Many maps of German mines show zones marked polyhalite; but these are merely salt deposits sprinkled with polyhalite to a maximum extent of 8 per cent of the latter, and this is too little to make the extraction of potash from it profitable.

"Some careless observers jumped to the conclusion that the Germans refrained from refining polyhalite, perhaps on account of some special difficulty or expense involved in the refining, while, as a matter of fact, they really have no polyhalite to refine. This mistaken notion of the difficulty of refining polyhalite was held by a number of geologists and chemists."

Primitive Road Improvement in Rural Illinois

One of our subscribers describes the construction of a country road which is of interest from an historical viewpoint. It seems that, 25 years ago, before the advent of the automobile, the farmers in a certain Illinois township decided to build three miles of "hard road." So eager were they for this desired improvement that they succeeded in raising *thirty-five hundred dollars* which actually accomplished the job! Here's the way the contractor did it under instructions from W. H. Ashelford.

With a four-horse team and a heavy walking plow, furrows 10 in. deep were run at a distance equivalent to wagon gauge, the dirt being thrown toward the roadsides. A shallow and broader furrow was also thrown from the center. Then these ruts were filled with crushed stone, with a segregation of the coarser pieces toward the bottom. This one-way road is still used.

Single Length of Wire Rope Seven Miles Long

What is said to be the longest single length of wire rope fabricated on the preformed principle was made recently by British Ropes, Ltd., of England, licensees from the American Cable Co., for the manufacture of this kind of Lang-lay rope. This new length is 37,500 ft. long, 1⅛ in. in diam., and weighs 35 tons, of 6 by 7 pattern of lay.

Thompsons Acquire Lease on Wagner Quarry

The Shelby Rock Quarry, which has been closed since the death of Fred Wagner, several months ago, has been leased by Loy and John Thompson, who will operate it as a crushed stone plant.

Gravel Quarry Changes Hands

The Southern Gravel orporation of Baltimore, Md., which operates plants in Pennsylvania, Virginia and South Carolina, has purchased the plant of the Southern Sand and Gravel Company, located about 20 miles east of Sanford, N. C., on the Atlantic and Western Railway, through Junius H. Harden and E. L. Henderson, of Burlington, N. C.

The property, which was placed in the hands of receivers about 18

This spool contains seven-mile length of wire rope

months ago, and later sold to Harden and Henderson, local capitalists, includes approximately 500 acres, owned in fee simple and leases, of excellent sand and gravel deposits and valuable machinery for plant operation.

The Southern Gravel Corporation, which is capitalized at $400,000, will begin work at once, and in the next few weeks, will begin making shipments of gravel and sand, Mr. Harden stated. The officers of the Baltimore company are: G. E. Norris, president and general manager; L. Leiper Winslow, treasurer; W. J. Dempsey, Jr., secretary.

Pacific Operator Installs Mica Grinding Unit

The Flynt Silica and Spar Company of Los Angeles, Cal., has recently installed two chaser type mills to grind mica. These mills use the wet grinding process, operating in conjunction with a dryer and reel classifiers produce all sizes of ground mica. The installation was designed by A. F. Flynt, president of the Flynt Silica and Spar Company to meet the particular requirements and has a capacity of two tons of the various sized products per day.

The product from these mills is sold to the roofing paper trade, automobile tire manufacturers in Southern California and is quite often used as artificial snow in the moving picture industry.

Fremont Company Opens Omaha Office

Fremont Foundry and Machine Co. of Fremont, Neb., opened a new office on March 1, 1930, at 316 Union State Bank Building, Omaha, Neb., in charge of A. J. Sholkofski, who has been a member of that firm for some time, in the capacity of salesman.

U. S. G. Acquires Additional Division

Acquisition of the metal lath division of the Youngstown Pressed Steel Company, Warren, Ohio, was announced by the United States Gypsum Company on March 11. Something more than a year ago the United States Gypsum Company entered the metal lath field, and growth of the business has made necessary increased production and distribution facilities.

That part of the Youngstown Pressed Steel Company's business acquired will continue under the same sales and operating personnel as the Youngstown Pressed Steel Metal Lath Division of the United States Gypsum Company. Only the metal lath division was acquired. Other divisions of the company will be operated by the Youngstown Pressed Steel Company as heretofore.

Metal lath products manufactured by the Milwaukee Corrugating Company and sold by the United States Gypsum Company under its Red Top Brand will be actively continued.

Locomotive Manufacturer Finds Business Good

The Geo. D. Whitcomb Company, Rochelle, Ill., has made such substantial progress for several years past in the manufacture and sale of gasoline, oil, and electric locomotives, in sizes from 3 tons to 100 tons, that it now operates its plant on the night shift. Gear-drive locomotives are built in sizes up to 60 tons. Since the first of the year orders have been received for numerous 40-ton and 50-ton six-wheel, full-gear and side-rod drive locomotives. To handle the increased business several units of machinery in the factory have been replaced by larger units.

Shovel Handles Oversize Rocks for Secondary Blasting

Twelve miles from Corsicanna, Texas, at the small town of Richland, is located the quarry and crushing plant of the James Stone Company which produces washed and screened crushed stone for railroad ballast and commercial use.

This plant is designed to produce 100 tons per hour. About 50 per cent of the material excavated requires crushing, and good washing is required for there is some clayey material which must be removed. Concrete aggregate, after being washed and rescreened, goes through a double washer so that an exceptionally clean product is produced to meet rigid specifications. The washing and screening plant was designed conjunctively by W. S. James and engineers of Link-Belt Company, who furnished much of the principal equipment, such as screens, washers, conveyor, multi-roll idlers, and transmission chain.

Shovel sorting out large rocks for secondary blasting

The quarry face is about 3,000 ft. in length. No overburden is removed, there being only a few inches of top soil. The rock is a medium gray limestone, which is shut from a 25-ft. face. Since it is heavily stratified, it breaks at times into large masses. The large pieces are then torn out and set back by a Link-Belt type K-42 shovel for secondary blasting.

An average of ten 6-cu. yd. Western dump-cars are loaded per hour. Two trains, consisting of ten cars each, operate intermittently over a single line of standard-gauge track, suitable switch-backs and short connecting feeders facilitating the transport of the rock from the pit to the crushing plant. The high output with the small crew of men results in low operating costs.

W. S. James is general manager and Chas. Candle is superintendent.

Sand and Gravel Resources of New York

The University of the State of New York has issued a bulletin on sand and gravel resources of the state which contains a mass of interesting data. It is unfortunate that these data were collected in 1926 and have not been revised to include recent developments. Many of the improvements suggested have already been put into practice. — *Empire State Gravelette.*

Atlantic Lime Secures High Voltage Line

The Georgia Power Company is constructing a 44,000 volt line to the Atlantic Lime Rock Company's plant, two miles from here, which will cost $20,000, it was announced by officials of the power company.

"Diatomaceous Earth"

A 250-page volume bearing the above title has been published by The Chemical Catalog Co., Inc., 419 Fourth Ave., New York, N. Y. Its author is Robert Calvert, chief chemist of Van Schaack Bros. Chemical Works, Chicago, Ill. It is one of a series of monographs published under the auspices of the American Chemical Society and the National Research Council.

This well-illustrated book describes the present-day industry in diatomaceous earth and indicates needed discoveries in a new field of research.

The sixteen chapters deal with geologic, geographic, physical, chemical and miscellaneous factors, mining and preparation, the use of this earth in various kinds of filtration, insulation, and absorption, and as an admix in portland cement and plaster.

The White Man's Burden Lightened

The Pennsylvania Highway Department has advised (it seems to have the ring of a command) all highway contractors to stockpile in advance of pouring concrete and to maintain a surplus of about 5,000 tons of aggregates on each job. This will greatly lengthen the producing season and reduce the stress of peak demands.—*Empire State Gravelette.*

Market for Rock Drills Is Strong

The Gardner-Denver Company reports a volume of business which tends to verify President Hoover's optimistic attitude. This company with plants in Denver, Colo., Quincy, Ill., and La Grange, Mo., expects its March sales to exceed those of either January or February, according to its vice-president, A. J. Philpott. The increase represents chiefly rock drills and portable compressors.

Sand Products Purchases Trap Rock Quarry

The Sand Products Corporation, Detroit, Mich., has exercised options on Bruce Mines trap quarry in Canada, and will spend about $500,000 in developing the property within the next two years.

Columbia Company Begins Manufacturing Brick

Columbia Brick Co., Dixon Sowell, manager, Riverside Drive, Columbia, Tenn., producer of sand, will begin manufacture of brick. Two new kilns, each with a capacity of 250,000, will be installed. Chambers Bros. Co., Philadelphia, Pa., and J. C. Steele & Sons, Statesville, N. C., are the machinery contractors.

Three-In-One

The Eastern Rock Products Corporation and Frank Boland, each having trucking plants at Chenango Bridge, have entered into a working arrangement, wherein the former will have charge of production and the latter will handle local distribution. It is probable that one of the plants will be shut down and a deposit on the D. L. & W. R. R. developed.—*Empire State Gravelette.*

Keystone Portland Awards Contract for Improvements

Keystone Portland Cement Co., Bath, Pa., has awarded a contract to Rust Engineering Co., Pittsburgh, for new improvements, which will include the erection of 19 concrete silos for cement storage, and two additional packhouses, each packhouse to have two Bates packing machines. Shipping facilities are expected to be doubled.

Atomite Corporation Plans to Rebuild

Atomite Corp., Arthur Kreiger, president and managing director, Pacific Bldg., Portland, Ore., will rebuild its mill which was completely destroyed by fire with $65,000 loss. Machinery destroyed included five gasoline engines and equipment for grinding, segregating and grading diatomaceous earth. Willis M. Bartlett is superintendent.

Sand Company Sustains Fire Loss

A fire which, March 14, cracked two large hoist drums and destroyed all the woodwork on the Pioneer Sand Company's portable barge-unloading plant (No. 1) at St. Joseph, Mo., almost destroyed the entire plant before it was noticed. Captain R. J. Stewart estimated the total loss to his company at about $2,500, part of which was covered by insurance.

Trackson Appoints Distributors

The Trackson Co. announces the appointment of the following new distributors, who will handle Trackson tractor equipment for McCormick-Deering tractors: The Highway Equipment Co., 919 First National Bldg., Columbus, O., for the Columbus territory; Industrial Tractor & Equipment Co., 2702 Spring Grove Ave., Cincinnati, O., for the Cincinnati territory; the Fred D. Marshall Co., Columbia, S. C., for the state of South Carolina; the H. O. Penn Machinery Co., 140 Street and East River, New York, N. Y., for the New York City territory; and the Raleigh Road Machinery Co., Raleigh, N. C., for North Carolina.

Tractors as Roustabouts

It is really a matter of interest to learn, from time to time, of the varied and unusual uses to which a Caterpillar tractor can be put. Thus we are told that it is used at one quarry to shift railroad track, that it is utilized at a sand and gravel pit as the power end of a dragline scraper, and now we learn that the Independent Concrete Pipe Company of Indianapolis, Ind., uses it to deliver large sections of pipe. This 60-type might be called a roustabout because it can be called upon to do so many odd jobs. One of these machines and a stoneboat last year snaked approximately 10,000 ft. of 84-in. concrete pipe for a single job at Niles Center, Ill.

Hauling heavy concrete pipe by tractor

Hearing On Cement Is Continued

Hearing of charges filed by the Three Forks Portland Cement Company against the railroads of the state, alleging that the rates on cement and other products in mixed carloads between points in Montana are unreasonable and unjust, was postponed until April 1, by the state board of railroad commissioners.

The hearing was originally scheduled for March 6, but requests for a continuance were received from the three transcontinental lines for the reason that they are to be engaged in a number of interstate cases during March. The cement company agreed to a continuance.

Who Is Mechanic's Lien Claimant?

It is well settled that any person who performs labor or supplies material for building purposes is entitled to a mechanic's lien on the improved property. Conversely, it is settled that a person who furnishes motor-trucks for hauling material used in the construction work is not entitled to a lien to secure payment for rental of his trucks.

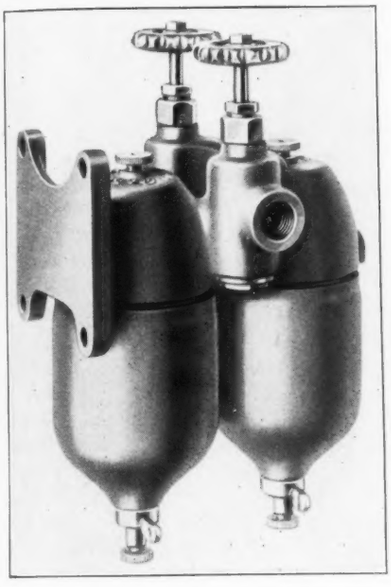
For instance, in Cramer v. Chosen, 147 Atl. 639, a sub-contractor hired motor-trucks and their drivers to haul sand, gravel, stone and like materials. The subcontractor failed to pay the rental charges for the trucks and drivers and the owner of the vehicles filed a mechanic's lien. However, the Court held the lien not enforceable, saying:

"The furnishing of automobile trucks and drivers to a contractor does not give a claim for 'labor' within the terms of the Mechanic's Lien Law.

NEW MACHINERY AND SUPPLIES

A Super Heavy-Duty Duplex Filter

The Zenith-Detroit Corporation of Detroit manufactures a number of different types of filters for use on different sizes and types of diesel engines. The one illustrated is a duplex of strong construction com-



Heavy-duty duplex filter

pactness and ease of cleaning and of large capacity, 260 gal. 32 Be. oil per hour under 5-lb. pressure or 900 gal. under 50-lb. pressure. Globe type leather seated valves control the flow to either side, and if unusual quantities of water or dirt come through the lines, it is a simple matter to switch over to the clean side of the filter and continue operating under full load, while cleaning the dirty side. It is fitted with standard ½-in. pipe connections.

Underfeed Coal Stoking Assures Perfect Firing

James Leffel & Co., Springfield, O., announces an automatic underfeeder stoker which is claimed assures perfect combustion conditions on a boiler grate. The machine is electrically operated (unless steam turbine drive is preferred and ordered) and the rate of firing, as well as the amount of air admitted to the fire box, is automatically controlled by the steam pressure of the boiler. In other words, lowered steam pressure will automatically increase the firing speed and force draft, so that the boiler will operate to its full efficiency at all times without attention.

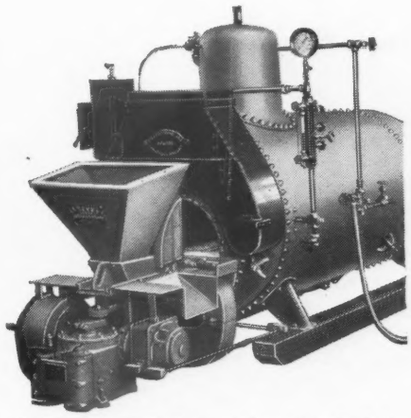
So complete is the combustion in a Leffel Scotch marine boiler fired by a Leffel automatic underfeed stoker that there is almost no ash to remove, and smoke and soot are virtually eliminated. The fire is fed from underneath and the ashes fall off at the sides of the fire box as the coal slowly comes up. There is never any choking of the fire by fresh fuel as the combustion is always at the top. Thus, far greater efficiency is possible from the amount of fuel used which may be added to the saving made possible by the elimination of labor and wasted time.

Exact Weighing Is Possible with Simple Machine

More and more it becomes necessary for operators to know accurately the amounts of materials that they are handling; and practice continually tends toward dependence upon weights rather than volumes. To meet this need, the John Markman Manufacturing Company, Forreston, Ill., makes an exceedingly rugged and dependable device which is strictly automatic in action, requires no power for its operation, and whose first cost is its only cost.

With this weigher, sand, gravel, lime, crushed rock, gypsum, cement, or any other material can be weighed accurately to a pound. The simplicity of this machine is a strong feature. Gravity supplies all of the power for its operation.

By any means desired the material is fed to the receiving hopper and passes down to the dumping chute, where it is batch-weighed in unit amounts which can be set at any weight between 300 lb. and 2,000 lb. When the fixed load is attained in the chute, the material promptly drops into the receptacles below. The cycle of loading and dumping continues so long as material is fed to the machine. A tally instrument registers every dump of the chute, up to 100,000; so that the total weight of material handled during any given period is the tally's count multiplied by the unit weight device as set.

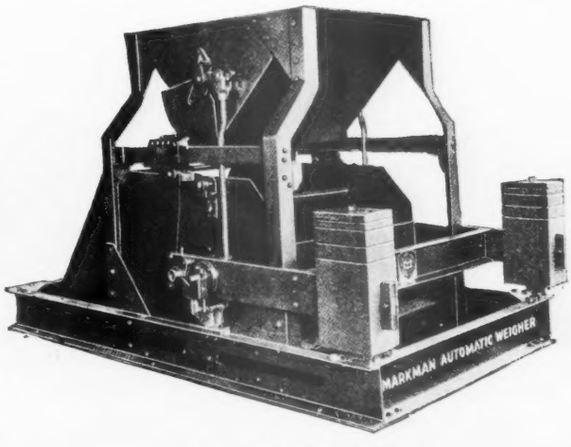


Automatic underfeed stoker attached to Scotch marine type boiler

Turbine-Type, Deep-Well Pumps Are Being Built for Great Lifts

The necessity that is occasionally felt by operators in supplying water for crushed-stone, sand-and-gravel, cement, lime, and other non-metallic mineral plants which are not situated near bodies of water nor within reach of public pipe lines is met by sinking deep wells, sometimes to considerable depths.

When engineers agree that the limit in size of water-lifting machines has been reached, some enterprising manufacturer produces a still larger one. At one time, water production from depths in excess of 300 ft. was thought impractical. Water development for California's lucrative citrus crops has probably influenced the building of larger pumps more than any other single factor. Continued pumping from wells in various localities gradually lowered the subterranean water levels until water production meant lifting 400 ft. or even 500 ft. to the surface. Early in 1929 a rec-



Exact weighing device

Giant turbine pump compared with ordinary-size pump

ord was established when a deep-well turbine pump was constructed and installed at Pomona, Calif. The total lifting head from below the ground was 540 ft. In this pump were incorporated many features which made it practical to go to much greater depths.

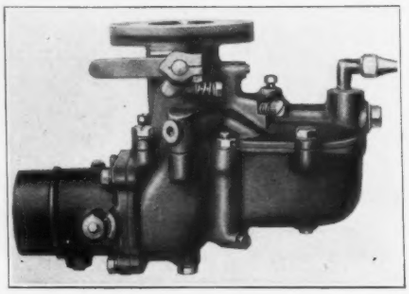
The real giant of turbine pumps was recently constructed by the Pomona Pump Company of Pomona, Calif. Water is lifted from approximately 850 ft. underground. The shipment to Mexico required two railway freight cars and weighed 48,000 lb. without the electric motor.

From the top of the motor on the surface to the lowest portion of the pump-bowls measures 864 ft. The problem of proper lubrication and prevention of whipping in a drive shaft of such great length was successfully solved by using a water-lubricated, resilient-type bearing. The shaft floats within a film of water and all vibrations are completely cushioned. The manufacturers deviated from the more common method of surrounding the shaft with an oil tube or using oil as a lubricant.

Twenty-five individual pump stages on bowls were used. Twelve of these were installed about 400 ft. underground and the remainder were at the 833-ft. level. Only one shaft is used as the separate sets of stages drive from the same motor mounted at the surface. The capacity of all sets is synchronized. An ingenious regulating device installed immediately below the top group compensates for increase in shaft length as the hydraulic load increases. The total weight of all moving parts is transmitted to an immense roller bearing in the pump head. This bearing runs in oil the temperature of which is controlled by water-cooling coils.

An Improved Carburetor

Among the equipment for internal combustion engines manufactured by the Zenith-Detroit Corporation, is its 90 series carburetor which is said to be manufactured to the highest standard of material for the heavy-duty class of service. The few wearing parts are accurately fitted and have large bearing areas to insure long life. The air and fuel passes are scientifically designed to provide a maximum capacity and accurate metering so as to assure full power development with smooth operation. Good material, simplicity of design and the absence of fragile castings are intended to make this an exceptionally durable and shock-proof carburetor.

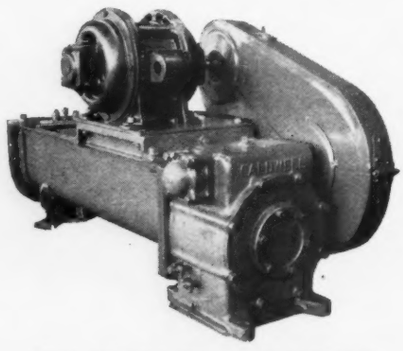


A new type carburetor

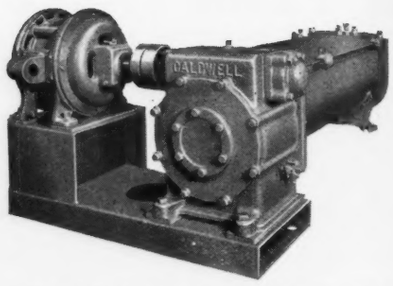
Standard Drives Available for Screw Conveyors

Pursuing its plan to standardize various driving mediums, H. W. Caldwell and Son Company, Chicago, has announced Caldwell standardized drives for screw conveyors. These new drives for conveyors from 8 in. to 16 in. in diam. are compact, clean-cut and trim in appearance, highly efficient, positive, and quiet in operation. The drives are made in two arrangements—type C and type D.

The type C drive consists of two speed reductions from motor to screw conveyor, each through a high-grade power transmission medium—a Link-Belt silent-chain drive fully enclosed in an oil-retaining steel casing, and efficient worm-gear speed reducer, designed to serve as a thrust end and screw-conveyor drive. The type D drive consists of a direct coupled reducer, mounted with motor on unit base-plate. This type of drive permits the selection of a Caldwell worm-gear reducer, according to horsepower rating, without regard to the size of the conveyor trough on which the drive is to be mounted.



Type C drive for screw conveyor



Type D drive for screw conveyor

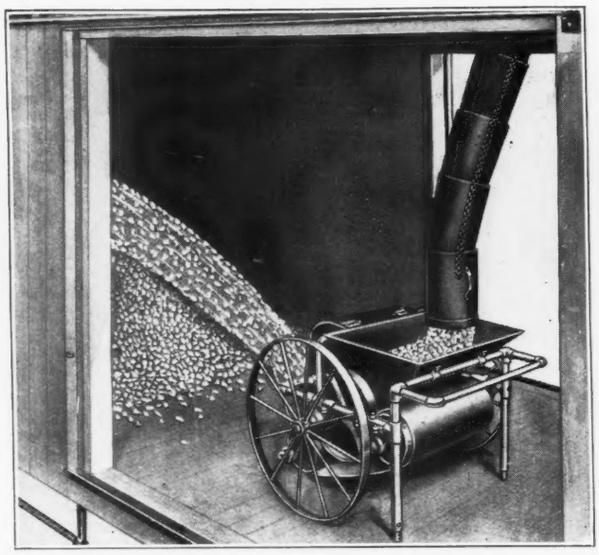
All of the reducer bearings on both types are anti-friction, with automatic lubrication. Oversize Timken bearings on a worm-gear shaft take the conveyor end-thrust in either direction. The drive is adaptable to horizontal or inclined conveyors, with proper adjustment of the oil levels. Standard motors of 860, 1160, 710 or 1430 r.p.m. can be accommodated. Standard drives provide a range of conveyor speeds from 45 to 125 r.p.m.

Loading Bulk Gypsum Into Box Cars

One method of loading bulk material into box cars without the necessity of hand trimming is with a centrifugal loading machine. The material is usually brought to the car door by a spout or a conveyor, but there is always the problem of securing maximum car loading with the smallest amount of labor and to have the loading accomplished quickly. Climbing into the car and over a pile of material to trim by hand is never required when material is loaded with a centrifugal-type box-car loader which throws the material to the farthest corners of the car. With gypsum, or, in fact, with any loose bulk material, this new high-speed centrifugal machine will load a car in about twenty minutes.

A small machine to convey material to the end of a car is an impossibility. To project the material, on the other hand, requires that it be given a rather high velocity. The ordinary straight-belt type of loader will not

impart the necessary velocity in a length of less than 10 or 12 ft. and a belt conveyor of this length is an awkward thing to handle inside a box car. It was found, however, that by making the carrying run of the belt travel on a curve, a large amount of additional traction is secured by centrifugal force which totals several times the natural force of gravity and causes the material to cling to the belt. By this means, the length of belt necessary to give the proper speed to the material can be cut down to less than 3 ft. and the loaders built on this principle are therefore but little larger than an ordinary wheelbarrow.



Centrifugal-type box-car loader handling bulk gypsum

Despite the extreme simplicity of this portable machine, its action is astonishingly effective. The material dropping through the passage at the bottom of the hopper meets the belt traveling in the same direction, i. e., downward. Therefore, all of the initial speed of the material due to falling is retained. From the moment the material touches the belt until it is discharged, it travels in a circular arc and is therefore held outward against the belt, where it picks up speed rapidly and, by the time it has reached the point of discharge, it has plenty of velocity to carry it to the far end of a box car. The material is projected in a steady stream or jet which forms a pile beginning at the far end of the car and works back toward the car door.

In addition to the lightness and compactness and consequent ease of handling, an important feature of the centrifugal loader is its low loading point. The top of the loading hopper is just 2 ft. 10 in. above the floor. This means that the storage bins from which the cars are loaded need not be built as high as for the straight-belt loaders. The machine weighs but 730 lb., operates on a 3-hp. motor, and is being manufactured by the Stephens-Adamson Manufacturing Company of Aurora, Ill.

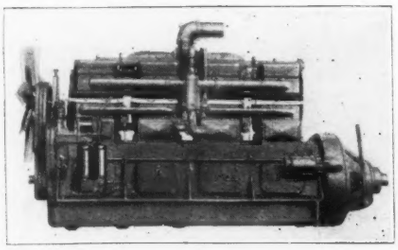
Straight-Eight Triple-Fuel Motor Announced

Carrying forward the policy of enlarging upon its field of activities, the Climax Engineering Company has announced the completion of its straight eight 6-in. by 7-in. valve-in-head motor. All of the outstanding characteristics of the Blue Streak Series are incorporated in this new model. Valving, spark-plug location, and flame travel are controlled to secure low detonating values and unusually smooth operation with high power output.

The engine develops more than 200 hp. at 1,000 r.p.m. and 225 hp. at 1,200 r.p.m., and the fuel rate is under 0.6 lb. per boiler hp.-hr. on gasoline.

This new model, known as the R81, is a triple-fuel burning engine, handling distillate and natural gas with the relatively marked efficiency present during gasoline burning operation. Forcefeed lubrication is employed, three oil pumps being provided to handle the lubricating oil from the end and main fuel supply sumps. All oil is carefully filtered before going to the bearings and a special oil strainer cleans the oil entering the overhead valve system.

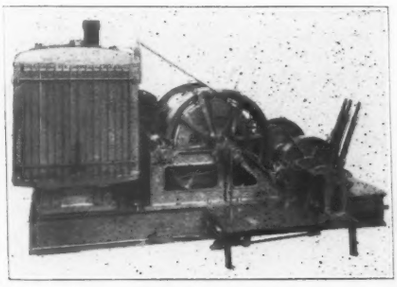
Cooling water enters at the top of the cylinders, giving thermo-syphon action in the jackets, passing up through the distributing parts in the head, around the spark plugs, between the valve pockets and combustion chamber, to the water outlet manifold. An eight-blade 36-in. fan with triple V-belt drive is incorporated in the design. Equipment includes two 2-in. Zenith carburetors, governor, magneto, and dual ignition. Two Leece Neville starting motors, one on each side of the engine, are used for starting purposes.



Straight-eight motor that operates on gasoline, distillate, or natural gas

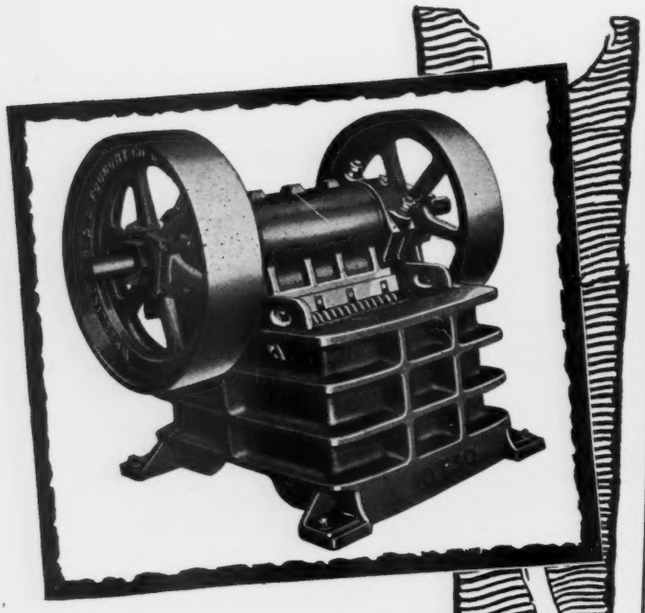
Heavy-Duty Dragline Operated by Portable Diesel

An interesting example of economical power in movable operations is furnished by the Inter-County River Improvement of Tacoma, Wash., in dredging work on the Stuck River. The Improvement conducts joint operations in dredging and building levees on rivers dividing King and Pierce Counties, Wash. The county commissioners of the two counties serve as the board of control, with Chief Engineer H. F. Gronen in actual charge of operations. The work consists of removing large gravel from the channel of the Stuck River, pulling it to the bank, and building it up to form a levee. Since the outfit works along the soft banks of the river and must be moved every two or three hours, light weight without sacrifice of available power was essential in selecting the power unit.



Portable 120-hp. diesel engine

Last fall the board purchased a 120-hp. Buda-M. A. N. Diesel engine, mounted on a steel frame with, and driving, a double-drum two-speed hoist. This machine operates a 3-cu. yd. heavy-duty dragline bucket. It was placed in operation November 1 and has operated since. Mr. Gronen presents these interesting details. The average haul is about 500 ft., the last 100 ft. being up a slope of about 3 or 4 to 1. The machine has been handling the bucket at a speed of 325 ft. per min. in high gear without difficulty. Fuel consumption per day is approximately 40 gal. of diesel oil at 4c per gal. Total approximate cost per day, including fuel and lubricating oils, labor, wire rope, and upkeep, amounts to about $24. Material handled averages between 500 and 600 cu. yd. per day, or at an average cost of less than 5c per cu. yd.



NEW SLANTS ON OLD IDEAS

If the Ancient Romans could have used a few Wheeling Roller Bearing Crushers, Rome might not have been "built in a day," but the process would have been hastened considerably. Road taxes along the Appian Way surely must have been paid off sooner, and the natives taken to bowling along, many years earlier, in their chariots at the cool of the eve, or whenever they were wont to go touring in the good old B. C. days. One fact we cannot deny. The Romans builded well.

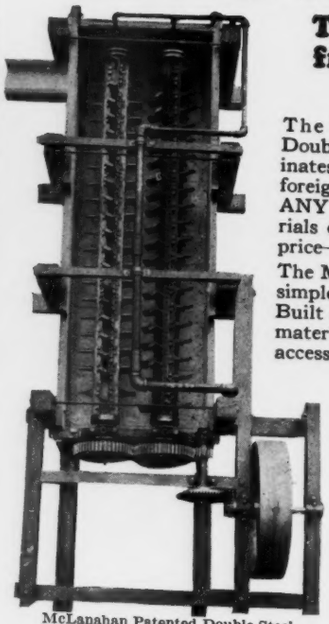
The same fact is true of Wheeling Roller Bearing Crushers today. They are built well—so well that they are the most adequate crushers yet placed before the operator, who more and more demands the utmost in production efficiency and economy.

If you are dragging along with inadequate crushing facilities you will do well to get all the facts on the Wheeling. Friction, vibration—out! Power Costs—down 50%. Production up 20 to 30%. Starting troubles absolutely eliminated.

Write Today.

WHEELING MOLD & FOUNDRY CO.
WHEELING, W. VA.

CLEANS



McLanahan Patented Double Steel Log Washer

Toughest clays from different products

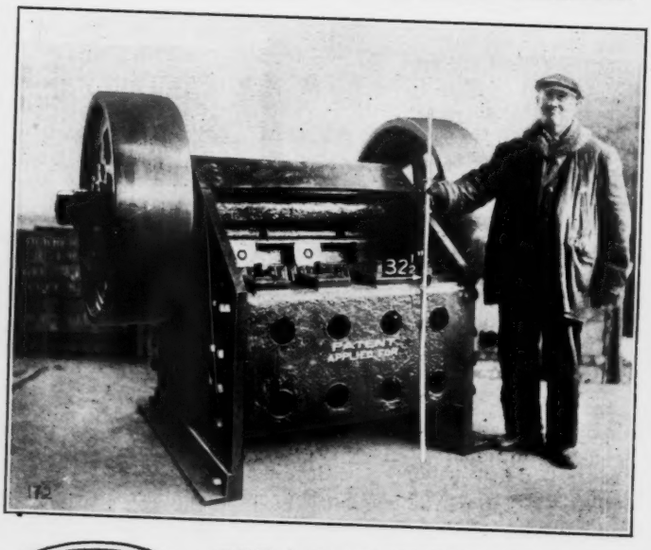
The McLanahan Improved Double Steel Log Washer eliminates toughest clays and other foreign matter from practically ANY PRODUCT. Clean materials command a higher market price—are more in demand.

The McLanahan Washer is very simple, ruggedly constructed. Built and arranged according to materials to be handled. Easily accessible for the very few repairs needed from time to time. Produces large tonnages of uniformly clean products at an extremely low cost.

May we tell you all about it?

Crushers, Scrubbers, Screens, Jigs, Elevators, Conveyors, Hoists, Dryers, etc.

McLANAHAN & STONE MACHINE COMPANY
HOLLIDAYSBURG, PENNA.



Good Roads MACHINERY

CHAMPION Roller Bearing REDUCTION CRUSHERS

ARE LOW AT FEEDING MOUTH—ONLY 32½ INCHES FROM FLOOR TO MOUTH—REGARDLESS OF SIZE—THE No. 1020, No. 1030 or No. 1040.

Equipped throughout with S K F Self-aligning Roller Bearings. Compact—can be placed in very confined spaces. Adaptable to direct drive from MOTOR with very short centers.

The Good Roads Machinery Co., Inc.

"A business established and in continuous operation for fifty-two years at Kennett Square—in Pennsylvania"

Branches at

New York — Watertown, Mass. — Chicago
Harrisburg, Pa. — Philadelphia — Pittsburgh — Frankfort, Ky.

NO TIPPING
NO ROCKING
EASILY OILED and GREASED
BOOM DIRECTLY over Roller Path
MEANS MORE YARDAGE

—and more yardage means

LONGER PROFITS

EXCESSIVE profits are strangers to the contractor in these days of close bidding, but you can make *longer profits* through *greater yardage* by putting the BAY-CITY Model K to work.

Model K is a light ½-yard full revolving shovel, convertible to crane, dragline, skimmer and trench hoe. Short tailswing permits working in close quarters. Independent friction clutches on each separate crawler makes it possible to turn around in minimum space.

The 8-in. center pin and the 6-foot roller path, equaling or exceeding similar parts on one yard machines, plus the mounting of the base of the boom less than 30-in. from the center pin, reduces rocking or tipping to an absolute minimum and mechanically balances the machine. This also enables the Model K to handle the same size buckets and same length booms that are used on machines three to five tons heavier—meaning economy and greater yardage with the flexibility and efficiency of a light ½-yard machine.

Investigate the Model K . . . Write us for further information or the name of our nearest distributor.

MODEL R
A 26-ton, heavy duty full revolving ¾-yd. shovel, crane or dragline.

MODEL K
Full revolving light ½-yd. convertible shovel. Weighs 14½ tons.

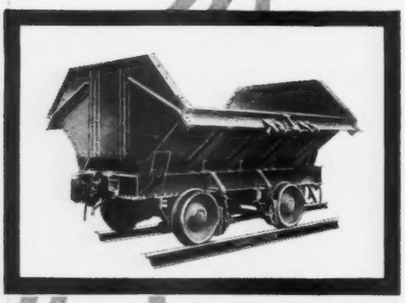
TRACTOR SHOVEL
Recognized leader in its field. Operates shovel, trench hoe, backfiller, etc. Weights 10 tons.

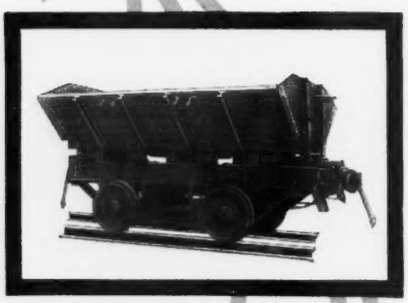
BAY CITY SHOVELS, Inc.
New York Office—302 Broadway BAY CITY, MICH.

BAY-CITY SHOVELS
THE BAY CITY FAMILY OF FAST WORKERS

KOPPEL CARS

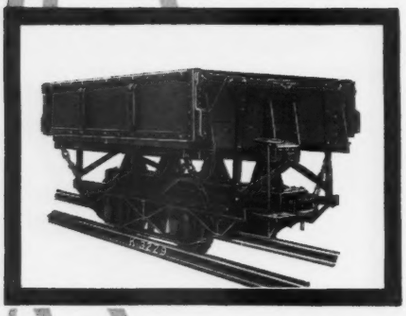
best for all purposes

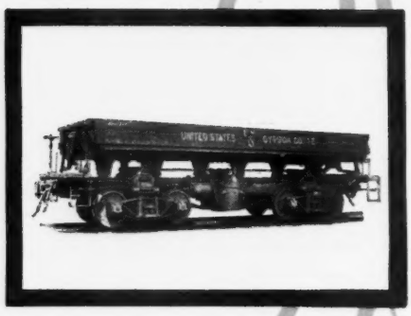




These six illustrations, representing equipment ranging from 2 cubic yards to 16 cubic yards capacity, are a few of the many types and designs built by this Company which have given satisfactory service in many quarries.

Our designs are not limited by size of equipment required for economical operations; they vary from 1 cubic yard capacity to 35 cubic yards capacity, the larger capacity designs being of the Koppel Air Dump Car type which are now being used in the largest American Limestone Quarries.

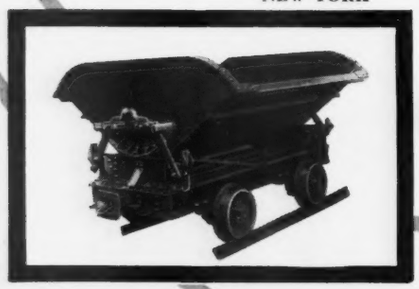




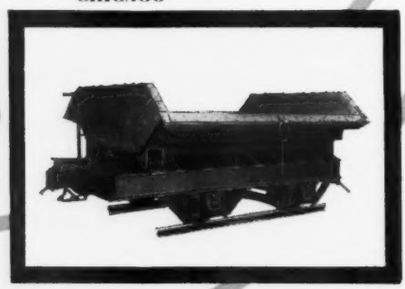
KOPPEL INDUSTRIAL CAR & EQUIPMENT CO.

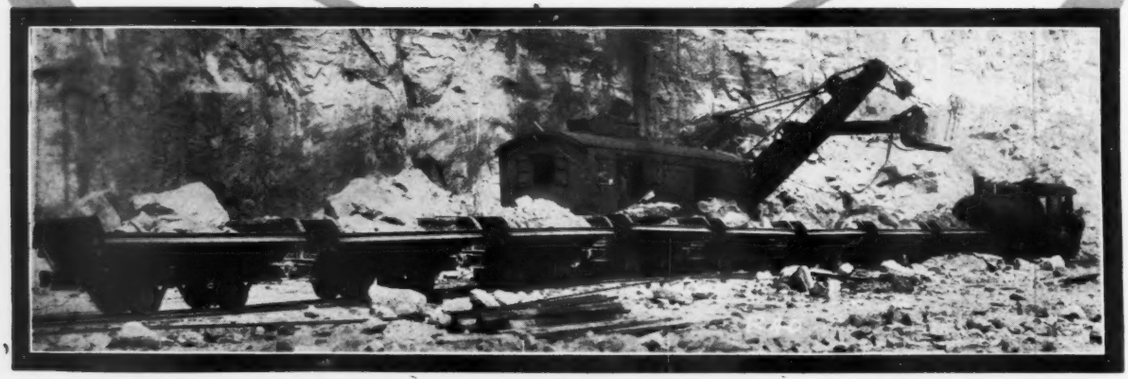
Koppel, Penna.

NEW YORK PITTSBURGH CHICAGO

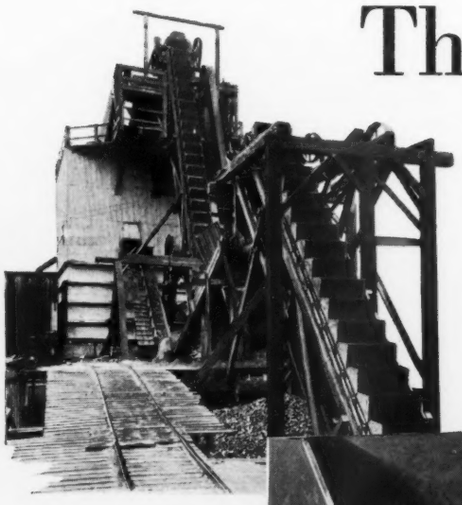


KOPPEL

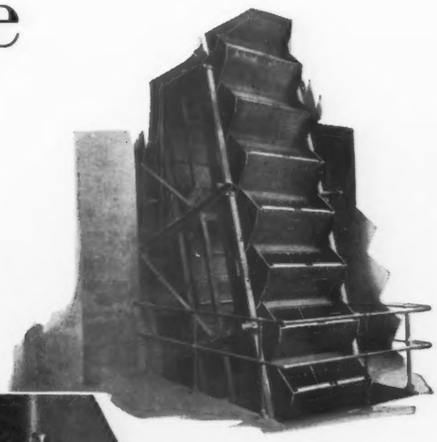




Elevator Buckets That Hold Their Shape



Jeffrey Heavy Duty Elevator serving a Stone Quarry.



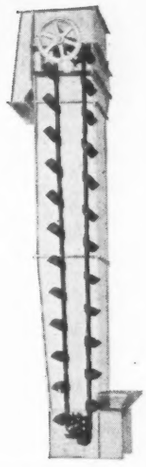
Style D Heavy Steel Bucket for continuous bucket type elevators handling large capacities of crushed stone, sand, gravel, etc.

Jeffrey Super-Capacity Elevator handling stone in a Cement Plant. These stone elevators have a capacity range of 300 to 750 tons per hour.

THE heavier elevating requirements of cement, Lime, Gypsum and Stone Plants call for elevators whose buckets will stand the strain of heavy loads, and falling blows from large size stone.

Super strength and stiffness are built into the buckets used on Jeffrey Heavy Duty and Super-Capacity Elevators. These buckets are constructed of ¼-inch steel plate throughout . . . . a stiffening angle on back prevents buckling . . . . another angle protects lip of bucket from the battering action of loaded crushed stone . . . . and all parts of buckets are securely riveted together. In the larger sizes, a center diaphragm riveted to front and back, guards against sagging.

Besides Jeffrey Super-Capacity and Heavy Duty Elevators, there are the Intermittent type Elevators with malleable or steel buckets for lighter capacities in handling cement, lime, gypsum, sand, gravel, stone, etc. Catalog No. 465-M gives complete specifications, capacities, etc., of both types. If you are interested in better elevators, we will be glad to send you a copy without obligation.



Jeffrey Bucket Elevators with intermittently spaced buckets are adapted to moderate handling capacity and can be furnished with or without steel casing. Both continuous and intermittent type of elevators can be made for either vertical or inclined operation.

THE JEFFREY MANUFACTURING COMPANY

917-99 North Fourth Street, Columbus, Ohio

New York	Pittsburgh	Cincinnati	Charleston, W. Va.	Houston
Buffalo	Utica	Cleveland	Milwaukee	Salt Lake City
Rochester, N. Y.	Boston	Detroit	St. Louis	Birmingham
Philadelphia	Scranton, Pa.	Chicago	Denver	

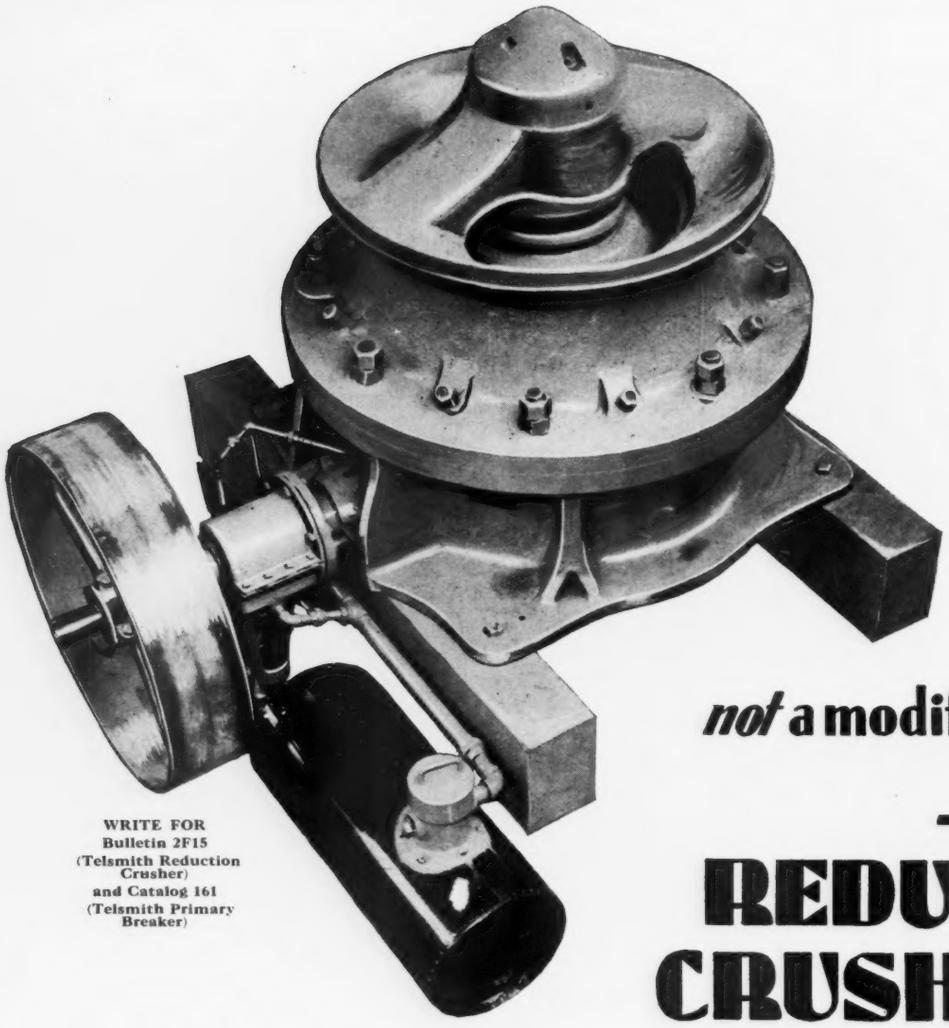
Jeffrey Manufacturing Co., Ltd., of Canada — Head Office and Works, Montreal; Branch Office, Toronto

JEFFREY

MATERIAL HANDLING EQUIPMENT

Jeffrey Products

Elevators
Conveyors
Trolley Conveyors
Portable Loaders
Coal and Ashes Handling Equipment
Skip Hoists
Chains and Attachments
Sprocket Wheels—Gears
Crushers—Pulverizers
Sand and Gravel Handling, Washing and Screening Equipment
Locomotives
Mine Equipment
Ventilation Fans



WRITE FOR
Bulletin 2F15
(Telsmith Reduction Crusher)
and Catalog 161
(Telsmith Primary Breaker)

not a modified breaker
—a Real
REDUCTION CRUSHER

OTHER crushers are flared outward at the top to increase the feed area . . . but Telsmith is different. The shape of Telsmith's crushing cone makes it a *real* reduction crusher. Telsmith's umbrella-shaped head and concaves *flare outward at the bottom to increase the discharge diameter.*

Close adjustment is possible because the circumference of Telsmith's discharge circle is so enormously increased that the bowl always clears freely. That's why Telsmith actually works best with a choke, unregulated, gravity feed. Pile the rock on . . . twenty feet high if you want to . . . so long as it's clean, dry and free from fines, *Telsmith will never clog.*

Short steel structure and short, fixed shaft . . . both guaranteed against breakage, by tramp iron . . . make Telsmith the world's strongest, most reliable secondary crusher.

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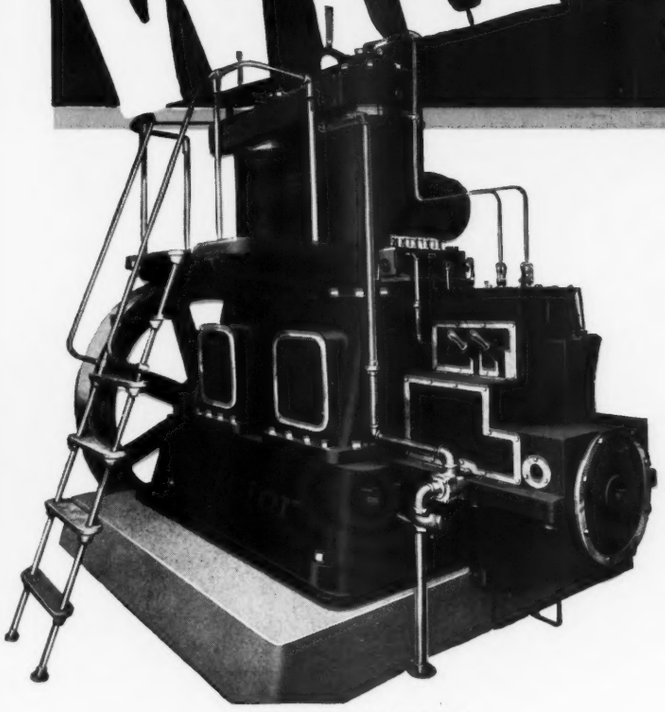
Philadelphia, Pa.

W. G. Kerr Co.,
Pittsburgh, Pa.

SMITH ENGINEERING WORKS, 88 Capitol Drive, Milwaukee, Wis.

TELSMITH R-5

Which Victor WILL BEST MEET YOUR POWER NEEDS?



VICTOR VERTICAL
DIESEL TYPE ENGINE

Your plant conditions may require the Horizontal type of engine or you may prefer the Vertical, in either case there is a VICTOR DIESEL TYPE PRIME MOVER that will meet your needs. Every Industry using power in any form can afford the VICTOR because of the economies it effects—it will pay its first cost within a very short period. VICTOR saves labor, saves space, saves ash-handling, uses little fuel and lubricating oil. Time-tried — we have been building Diesel Type Engines for more than 27 years and have placed more than 3,000 in service in every kind of industry. Built for long, hard, exacting service by a concern who has specialized in the production of precision machinery for two generations—the Power Manufacturing Company is a subsidiary of The Osgood Company who operate five large plants and whose product is used in every civilized country. If you have a power problem, the VICTOR is the solution. Let us tell you more about it.

THE POWER MANUFACTURING COMPANY
Subsidiary of The Osgood Company
MARION, OHIO

BOTH EFFICIENT!

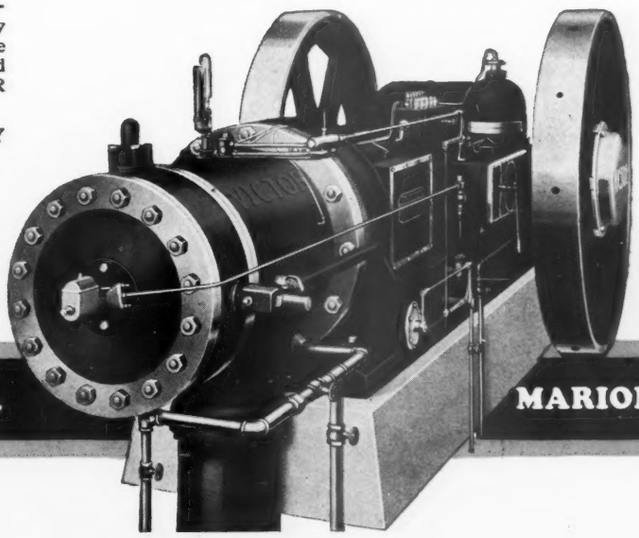
BOTH ECONOMICAL!!

BOTH PRACTICAL!!!

BOTH ARE THE RESULT OF 27 YEARS CONTINUOUS EXPERIENCE IN THE DESIGN, MANUFACTURE AND OPERATION OF DIESEL TYPE ENGINES.

3000

IN SERVICE IN EVERY KIND OF INDUSTRY.



VICTOR HORIZONTAL
DIESEL TYPE ENGINE

THE POWER MFG. CO. MARION, O.

Order Your Copy Now

1930 PIT and QUARRY HANDBOOK and DIRECTORY

The 1930 HANDBOOK and Directory represents the biggest value in authoritative information on the pit and quarry industries that has ever been published. This standard authority will be larger and more easily readable than ever before. 9x12 page size, heavier enamel paper, larger type and illustrations—beautifully and securely bound.

The technical and semi-technical treatises answer practically every question that arises in the location, design, equipment and operation of pits, quarries, mills, etc.,—describing also the most modern methods and machinery in detail. Most of this information is original and nowhere else in print—so complete and authentic as to command respect and usage by every operator, large or small. Arranged in a manner to produce facts and data instantly, without wading through a mass of other matter to obtain them. An index at the beginning of each section further facilitates reference.

Operator's Buying Guide

Descriptive advertisements of machinery and supplies involved in operations discussed in each technical section are interleaved. Instant reference to these advertisements is made timely by their positions and easy by any of the three indices in the back of the book.

Directory

Alphabetical and geographical lists of producers of non-metallic minerals throughout the United States, giving all important information regarding their product, type of operation, annual capacity, and names of executives, will be contained in the Directory section.

Price

$ 5.00 per year
12.00 for 3 years

Clubbed with PIT and QUARRY for only $1.00 per year additional

These rates for North and South America and U. S. Possessions
Other countries add $1.00 per year per publication

Orders will be filled in the order in which they are received, and we respectfully urge you to send yours in NOW. Remember, you pay nothing until you receive your HANDBOOK.

Complete Service Publishing Co.

538 S. Clark Street **Chicago, Ill.**

ALL BEARINGS—and even drums—from 36" boom point sheave to the conical rollers on the rotating path are Timken equipped — an absolute minimum of friction losses. (You can actually swing the shovel from the ground by hand.)

90% OF ALL CASTINGS used in the Lima "101" are *steel* - - several tons more than are used on any other shovel of similar *rated capacity*. Quality inbuilt to insure long, uninterrupted service.

FULL FLOATING DRIVE SHAFT—relieved of all bearing pressure from the shovel by five hammered alloy steel, heat treated axles — permits of steering, by wheel from operator's seat in the cab, a radius in twice the width of the crawler trucks or in a wide radius.

SINGLE LINE HOIST for super speed and super-power. No extra, small diameter sheaves to flex and wear out cable — not even a bail to interfere with hoisting above the boom.

LIMA "101"

UPPER ROTATING FRAME CASTING is a one-piece, heat treated alloy steel casting with main machinery supports cast integral—not a single bolt or rivet to work loose —insuring perfect alignment of all bearings and gears.

ALL STEEL, TRUSS reinforced BOOM and all steel, inside type dipper handle. Nothing to rot or warp and the ideal type of construction for heavy duty. All steel boom and handle construction is used on most of the larger heavy duty shovels.

EXCLUSIVE, INDEPENDENT DIFFERENTIAL CROWD permits of fast, cushioned shaking of the dipper. Powerful enough to crowd out loaded dipper to last tooth in racking with ease — and positive enough to hold it there indefinitely.

Features that mean greater profits.

Since the first day that LIMA "101" stepped into the field as a finished standardized gasoline shovel, dragline, crane and dragshovel, it has been outperforming all other 1 yard and 1¼ yard shovels on the market. Its power, speed and dependability have attracted the attention of the whole excavating industry. No other excavator of the same capacity has so many new and practical features—features that insure longer life, greater profits, and ease of operation.

A copy of Bulletin 301 which illustrates and describes the LIMA "101" in detail will be sent on request'

The Ohio Power Shovel Co.

Division of Lima Locomotive Works Incorporated

Lima, Ohio

Western Office
846 Straus Bldg.,
Chicago

Eastern Office
2351 Graybar Bldg.,
New York

LIMA "101"

PUT IT ON ONE END

A simple material-moving idea that is earning thousands of dollars for big and little sand and gravel plants all over the country

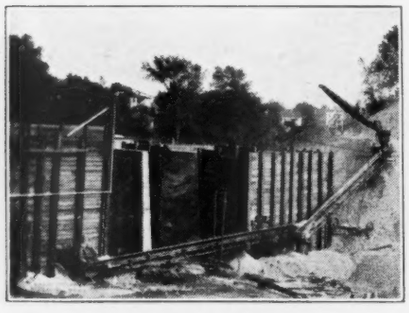
Each Barber-Greene Conveyor Belt is a broad, swiftly moving highway that carries your sand or gravel from where you have it to where you want it.

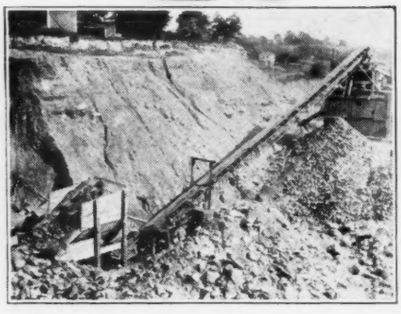
Carries up to and beyond 300 lineal feet, and elevation angles up to 35 degrees are not uncommon.

You simply put the stuff on one end and watch it come off the other.

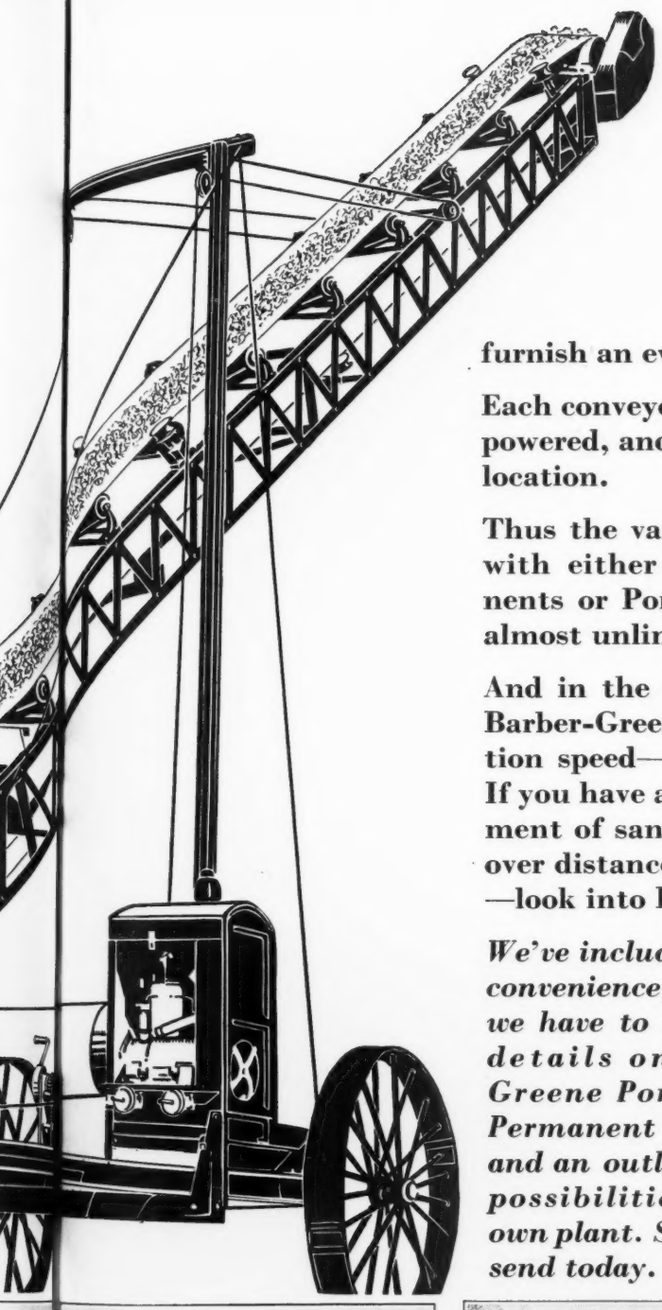
Each Barber-Greene Conveyor is built up of standardized Warren Truss Sections. Permanent or semi-permanent conveyors can be easily installed or rearranged to meet any conditions.

And Barber-Greene Portables, available in lengths from 15 to 60 feet,





BARBER B STANDARDIZED MATERIAL HANDLING MACHINES G **GR**



WATCH IT COME OFF THE OTHER

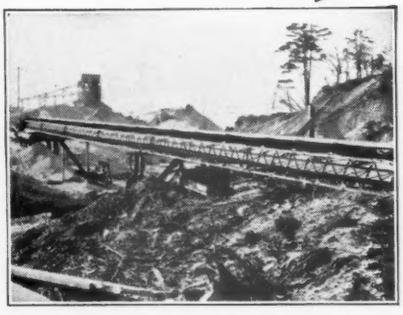
furnish an even more flexible Set-up.

Each conveyor is self-contained, self-powered, and readily moved to a new location.

Thus the variety of possible layouts with either Barber-Greene Permanents or Portables in the big pit is almost unlimited.

And in the smaller pits one or two Barber-Greenes provide big production speed—at a relatively low cost. If you have a job involving the movement of sand or gravel or strippings over distances of from 15 feet on up —look into Barber-Greenes.

We've included this coupon for your convenience, to help you check what we have to offer. It brings you the details on Barber-Greene Portable and Permanent Conveyors and an outline of their possibilities in your own plant. So fill in and send today.



RE E N E

BARBER-GREENE COMPANY, 492 West Park Avenue, Aurora, Illinois
Send me a copy of "*New Applications and Set-ups.*"

Name.....

Address.....

City..... State.....

200-225 H.P.
8 CYLINDERS

New Smoothness
New Sweetness
New Flexibility

with all the efficiency of Blue Streak Combustion

Tremendous power, conservatively rated at 200 h. p., at 1,000 r.p.m., with Blue Streak smoothness, Blue Streak fuel savings, and Blue Streak flexibility, is the story told by this newest Climax Development.

For you get the inherent power of 8-in-line, 6" x 7" cylinders, plus the efficient combustion that only Blue Streak design can give.

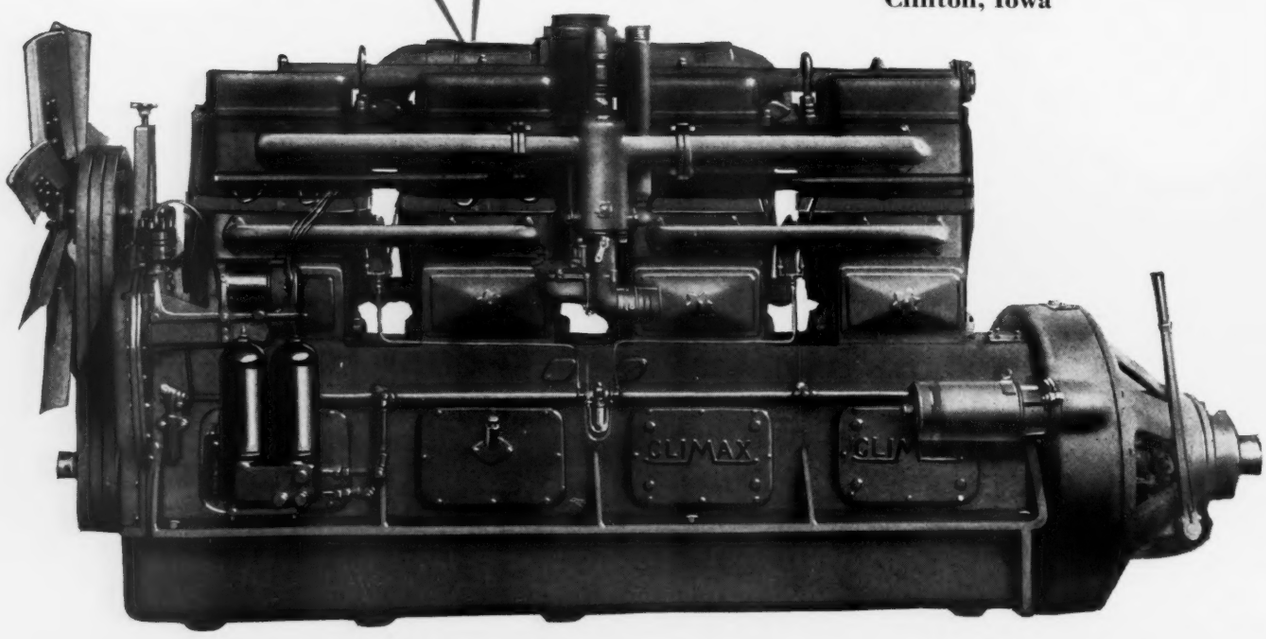
This remarkable combustion, developed by Climax Heavy Duty Engines alone, is produced by radically advanced head, manifold and overhead valve design. It makes each fuel drop give all it's got.

Result: 10 to 12% more power with about 10% less fuel than the average engine of equal piston displacement — torque characteristics closely similar to steam—and no "ping" or stalling on heavy loads at low speeds.

CLIMAX

Trade-Mark Reg. U. S. Pat. Off.

CLIMAX ENGINEERING COMPANY
82 West 18th Avenue
Clinton, Iowa

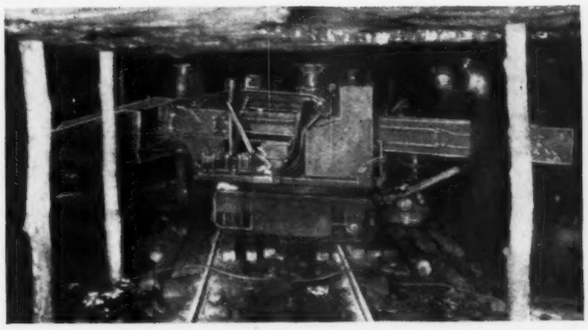


Mine Operators—

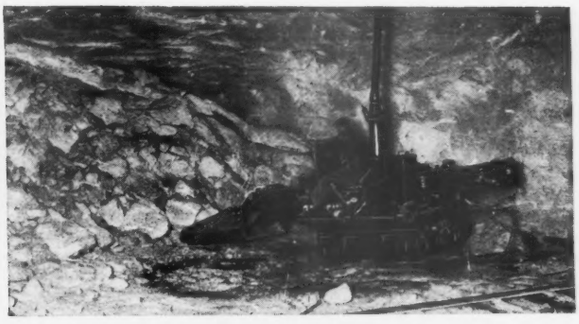
Lime—Cement—Gypsum—
Clay—Ore—Salt—or Coal

The GOODMAN POWER SHOVEL loads cars at the face!

Loaded Scoop Swinging Over Car



Crossing Room Track to Reach New Face



Loading Out Many Tons of Salt at One Setting

Loading Cars at a Considerable Distance

Ore Ejected from Scoop to Car

Lifting a Scoopful of Coal through the Pile

Tonnages per Man Are Doubled!

Labor Loading Costs Are Cut in Half!

The thorough mine inspection always made before a Power Shovel is installed is a big reason for the universal success of this loader. No expense to you—no obligation, of course.

Investigate—it may pay you!

Ask for Book 270-A—Free upon Request

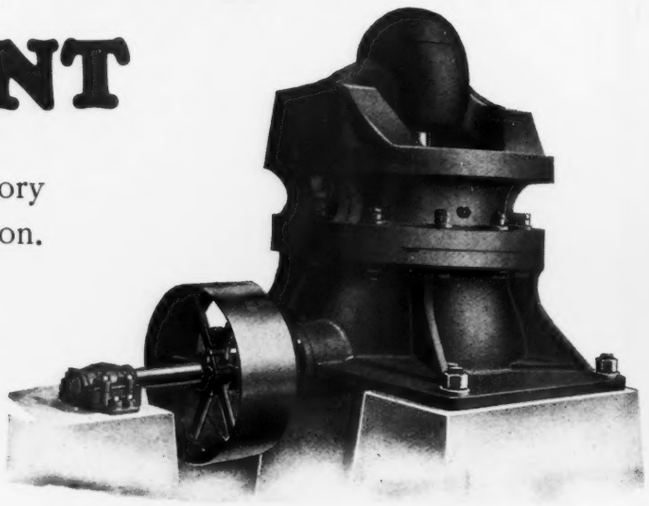
BUILDERS OF LOADING MACHINES FOR 17 YEARS

GOODMAN MANUFACTURING COMPANY HALSTED ST. at 48TH CHICAGO---ILL. LOADERS AND LOCOMOTIVES

(25)

- - and in England's SUPER-PLANT

A Traylor Bulldog Finishing Gyratory Crusher is giving great satisfaction.



Waterlip Quarry, of the Mendip Mountain Quarries Company, near Cranmore, Somerset, England, completed a modern crushing plant in 1927 that is a monument to British enterprise and skill. With a maximum capacity of about 10,000 tons of crushed limestone rock per week, this super-plant is probably the largest and most modern in England.

The 6-in. Traylor Finishing Crusher reduces the limestone from 2½ in. and 1 in. sizes to ¾ in. or ½ in. and under.

Operators every where have found Traylor Bulldog Finishing Gyratory Crushers particularly adapted for the production of small sizes—for use after the initial or secondary breaker—or as auxiliaries, tapping feed from the storage bins of larger sizes. For high tonnage, dependable operation and low power costs this crusher has no equal.

Some Users of

Bulldog Finishing Gyratory Crushers

4½ Inch

1 Hawaiian Contracting Co.	Honolulu, Hawaii
1 Arizona Sand & Rock Co.	Phoenix, Ariz.
1 Castle-Tretheway Mines, Ltd.	Elk Lake, Ont., Can.
1 Vermont Asbestos Corp.	Hyde Park, Vt.

6 Inch

1 Oregon Sand & Gravel Co.	Oregon City, Ore.
2 Hecla Mining Co.	Burke, Idaho
2 Independence Sand & Gravel Co.	Independence, Ore.
1 Belmont Gurnee Stone Co.	West Nyack, N. Y.
1 Fanwood Stone Crush. & Quarry Co.	Plainfield, N. J.
2 Patino Mines & Ent. Cons.	Para, Bolivia
1 Colonial Sand & Stone Co., Inc.	Little Neck, L. I., N. Y.

10 Inch

1 Cons. Mng. & Smelt. Co. of Can.	McDougall, B. C., Can.
1 Great Lakes Gravel Co.	Detroit, Mich.
2 Dominion Trap Rock Co., Ltd.	Bruce, Ont.
1 Henry Steers, Inc.	Jersey City, N. J.

15 Inch

1 Beachville White Lime Co., Ltd.	Beachville, Ont., Can.
1 General Crushed Stone Co.	Glen Mills, Pa.

20 Inch

1 Pickands Mather & Company	Negaunee, Mich.
1 Palmer Mining Company	Palmer, Mich.
1 New York Trap Rock Co.	Verplank, N. Y.

If you would like the whole story, just say where and when we shall send our man!—and be sure to send for Bulletin 2109!

TRAYLOR ENGINEERING & MANUFACTURING CO.
ALLENTOWN, PENNSYLVANIA, U.S.A.

New York City, 30 Church St. · Chicago, 1414 Fisher Bldg. · Los Angeles, 908-909 Chester Williams Bldg. · Seattle, 815 Alaska Bldg. · Salt Lake City, 101 W. 2nd So. St.

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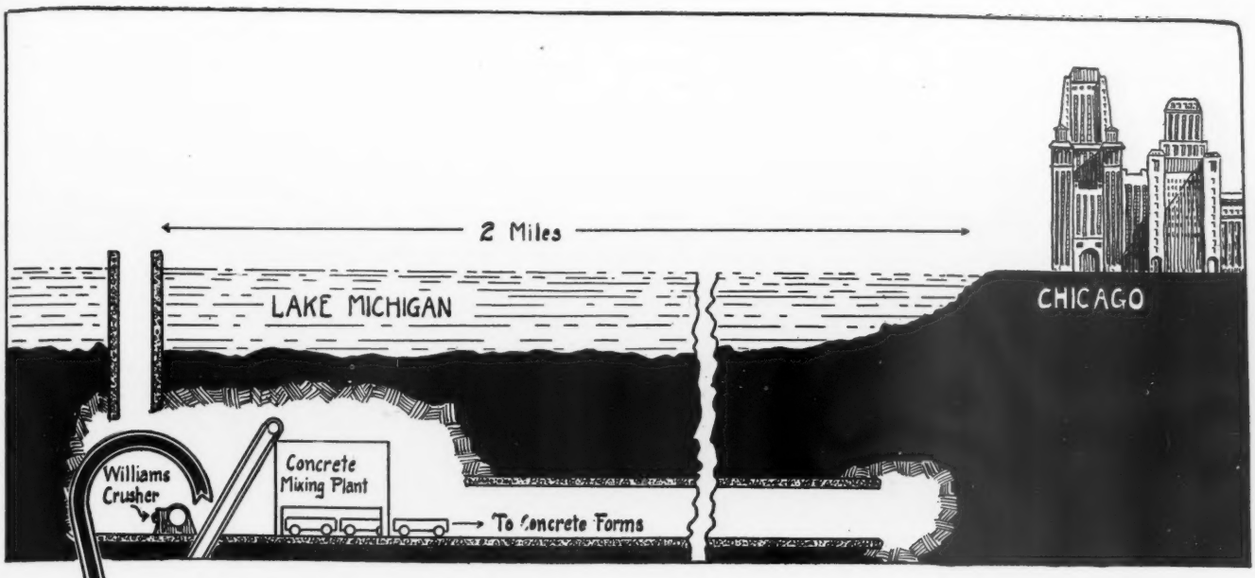
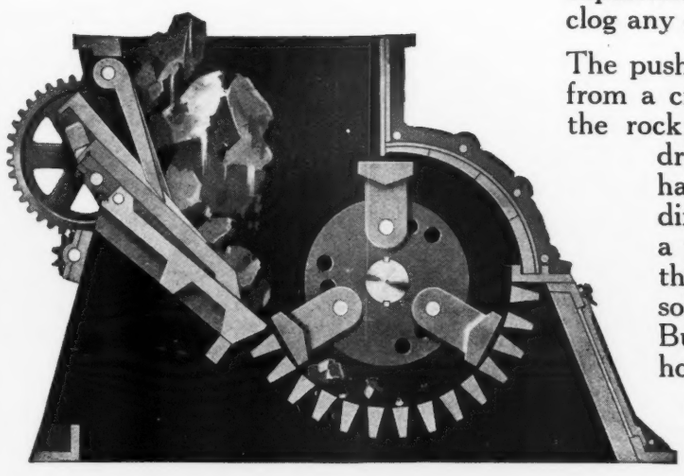


Crushing Wet, Mucky Rock in Chicago's future water supply tunnel

Two miles out in Lake Michigan and 220 feet down, the city of Chicago operates a Williams "Pusher" type Hammer Crusher. Its job is to take the wet, mucky rock, 75 tons per hour, containing about all the water it will hold, as shot out of the new 16 feet diameter water intake tunnel and convert it into 1½-inch concrete stone for relining the long tube.

Here again the "Pusher" type is giving ample evidence of its superiority in handling wet, sticky stone which would clog any other crusher.



The pusher action is positive. Two rams operated from a crank shaft work back and forth and push the rock into the path of the hammers. It's all driven from the main crusher shaft and will handle clay, shale, soft limestone and similar difficult material. Cement plants which crush a percentage of their overburden along with their stone are finding in the Pusher, the solution of a formerly difficult problem. Built in capacities from 50 to 300 tons per hour. Get our recommendations on your work.

WILLIAMS PATENT CRUSHER & PULVERIZER CO.
802 ST. LOUIS AVE., ST. LOUIS, MO.

Chicago	New York	San Francisco
37 W. Van Buren St.	15 Park Row	337 Rialto Bldg

THE WILLIAMS PATENT CRUSHER & PULVERIZER CO. ST. LOUIS, MO. U.S.A. TRADE MARK
REG U.S. PAT OFF

Williams
OLDEST AND LARGEST BUILDERS OF HAMMERMILLS IN THE WORLD
WILLIAMS
PATENT CRUSHERS GRINDERS SHREDDERS

This Firm Wanted a Man

"Note in your employment department you state that you are willing to place your subscribers in touch with certain applicants who are wanting jobs.

"Writer has recently engaged in the crushed stone and agricultural lime manufacturing business here. Have a very nice quarry and outfit, capacity of 100 to 250 tons per day. I need a practical foreman who is able to look after the entire operation, except the office and selling end."

Very truly yours,
E. M. Bassett,
BASSETT PRODUCTS CO.

This Man Wanted a Job

"I have been employed by the Bassett Hardwood Manufacturing Company here and thank you for your assistance.

"Your employment service is as good as it is unique. I know of no other like it."

Yours truly,
BEN SHAFFORD.

PIT & QUARRY DID THE REST!

CAN YOU USE THESE MEN ?

The PIT AND QUARRY Employment Service for subscribers has registered the following applicants for positions. Perhaps you have an opening in your organization for one of these men. If so, PIT AND QUARRY will be pleased to put you in touch with the applicant if you will advise us which one fills your requirements.

1-A. 12 years' experience Highway construction and sand and gravel. Can design and install own pits. Ready-Mix concrete. Have operated Central Mixing plants.

4. Quarry superintendent; 10 years' experience.

5. Chief engineer cement plant; 10 years' experience; desires connection with engineering or manufacturing firm, either in the office or in the field.

9. Quarry foreman, 6 years' experience.

10. Superintendent; 10 years' experience; lime and stone.

11. Superintendent crushed stone; 25 years' experience.

12. 10 years' experience in production of crushed gravel and sand; design engineer and builder; general superintendent; has had some sales experience. Experience covers the entire field.

14. Thoroughly experienced superintendent who has also in the past been assistant superintendent and foreman of granite and lime quarries; at present not employed.

15. Experienced superintendent or manager; graduate engineer; 12 years' experience in sand and gravel production and plant design.

16. Superintendent, 30 yrs. experience, mine, mill and quarry and large shovel operations, thorough knowledge of various systems of underground and open pit mining. Development work from grass roots to mill construction and operation, copper, iron, zinc and non-metallics, 4 yrs. special work in asbestos, mica and kaolin, good organizer and good production and safety record but not a college graduate. South, Southwest or Tropics preferred.

18. Superintendent of stone crushing and sand and gravel plant with considerable experience in operation of dredges, draglines, electric and steam shovels, all kinds of crushing, conveying, screening equipment. Can furnish excellent references, good record and details of past experience.

19. Electric Shovel Operator with considerable experience. Also power-house and general electrician, maintenance, welding, repairing gasoline truck motors, crushers, screens and various kinds of equipment.

20. Crushed stone superintendent since 1903; prefer West or Southwest territory; thoroughly experienced in construction and operation of plants, know how to get best results from the quarry end.

21. Cement plant superintendent or heavy limestone quarry; 20 years' experience in construction and operating plants.

22. In the capacity of plant and quarry superintendent 12 years. Prefer Oklahoma or Texas, or some Southern locality.

23. Superintendent, thoroughly experienced in operation of sand and gravel and crushed stone plants.

24. Superintendent, stone quarry or slag plant, 16 years office and operating experience.

25. Dragline, Crane and Shovel Operator, 9 years experience in steam and 3 years on electric shovel (Marion), desires position as operator. Can do own repairing. Permanent connection desired. Married. References furnished. Will go anywhere, but a location near good schools preferred.

26. Operator with 5 years' experience on Link-Belt and Koehring cranes. Also 7 years' experience in sand and gravel pit. Available now. Go anywhere.

27. Laboratory work, 3 years' experience as Asst. Chemist doing control and analytical work. College graduate, B. S. degree.

28. 12 years' experience as cement burner and night foreman and watchman.

EMPLOYMENT DEPARTMENT
PIT AND QUARRY
538 South Clark Street **Chicago, Illinois**

WHY AN OWEN COSTS LESS TO OPERATE

CAREFUL design and construction that omits no detail, insures continuous economical operation and lasting uninterrupted service for Owen Buckets. All wear is eliminated from castings, bars and plates. Heat-treated pins and shafts turn in bushings made of thoroughly tested metals. Alemite lubrication is used throughout, with grease reservoirs at necessary locations. Lips and teeth are of strong, high carbon and wear-resistant alloy steels. Cable is protected from chafing by 4 hardened steel rollers. Rapid reaving is obtained with holding and closing line sockets—without the use of cable clips. And, all parts of an Owen bucket are *guaranteed against breakage.* Write for "17 Points of Leadership."

THE OWEN BUCKET CO.

6017 Breakwater Ave., Cleveland, O.

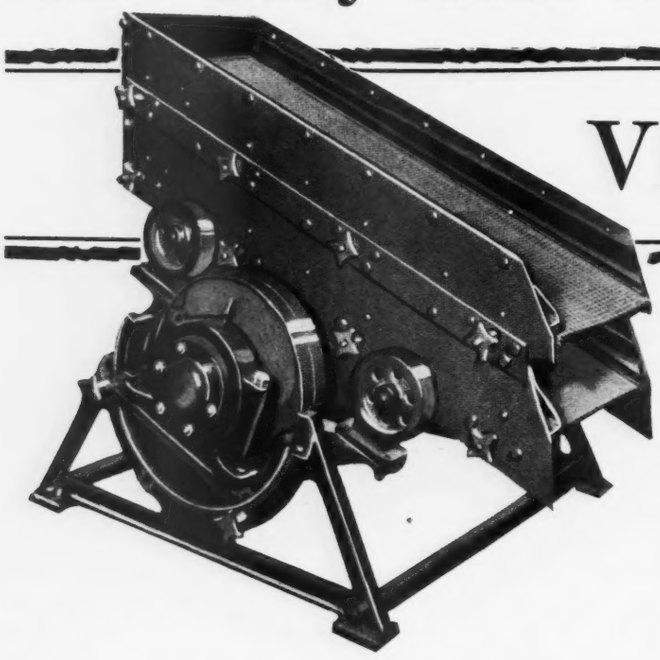
17 POINTS OF LEADERSHIP

1. One-piece steel crosshead.
2. No wear in upper or lower arm ends.
3. Heavy high carbon steel arms.
4. Adjustable undiminished closing power.
5. Long life to sheaves and cable.
6. **Long arm bolt bearings sealed from grit.**
7. Lever type steel arm brackets.
8. **Closing cable is protected against excessive wear.**
9. Heavy shock-resisting renewable lips.
10. **Cable clips eliminated.**
11. Sealed center shaft bearings.
12. Greater digging power with no dead weight.
13. Penetration and clean dumping.
14. Dropping shocks absorbed, eliminating breakage.
15. Rigid shell construction.
16. **Heavy duty, high carbon drop-forged steel teeth.**
17. Lips or teeth points hit first.

OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAY'S WORK

Owen Buckets

The Only Real Adjustable VIBRATION



The JIGGER is a circle-throw Vibrating Screen with either up or down-hill action that positively *will not clog.*

Eight years' extended research has produced a revelation in adjustable vibration, in flexibility and screening efficiency. In The JIGGER it is only necessary to change the relative positions of both the eccentric shaft and tube to obtain the proper circle-throw action. By this simple patented feature any one of "1000 variations" can be selected to secure efficient grading. Vibration is positive at all times—regardless of load conditions.

The JIGGER Advantages

VERY LARGE CAPACITIES—Counterflow rotation pulls fines through immediately. Uniform action—no dead spots.

ACCURACY IN SIZING—Quick, easy tilting to desired angle—even while running. Adjustable vibration to suit the material. No migration—product always controlled.

COMPACTNESS—FAST CLOTH CHANGE
Screen cloth can be changed in 5 minutes. Screen occupies small floor space.

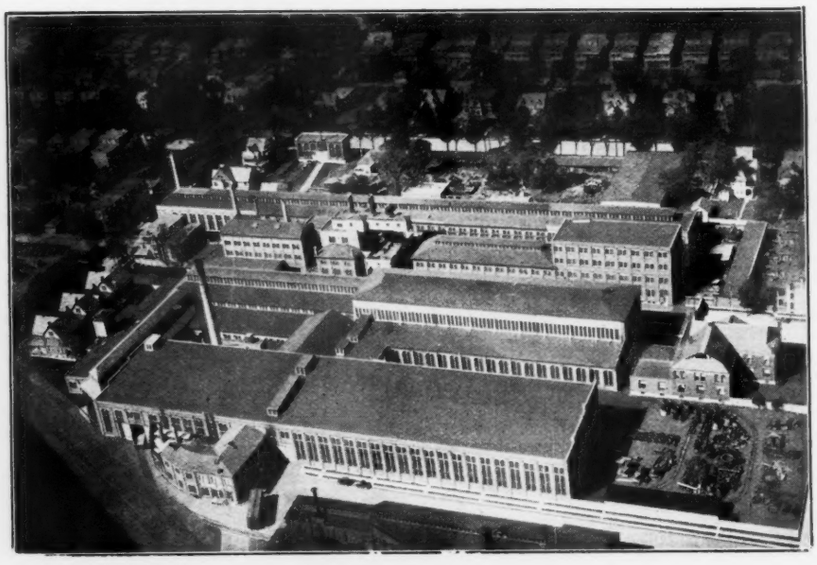
A HIT IN OHIO

The Builders Sand Co., of Cleveland, Ohio, says of The JIGGER: " . . . regarding performance of the No. 24 size 2′ x 5′ JIGGER Screen, installed at our Krumroy Plant last June, please be informed that this machine has given excellent satisfaction, better separation and more tonnage."

"Krumroy is located in water spring region which makes the sand wet about 95% of the time. This is not the only difficulty, as this product coming from the earth has a 25% loam or clay deposit, which makes it extremely difficult for production and proper separation. When the material is extremely wet, the instant speed and throw change of The JIGGER gives the desired results. *This is not true of other screen machines . . .* "

This letter is a typical experience of many leading plants that have installed JIGGERS. Standard sizes from 1′ x 3′ to 4′ x 8′. Special sizes built to order. Let us send you complete information.

Where The JIGGER is Made



York, Penna.

PRODUCTIVE EQUIPMENT CORPORATION

7535 SOUTH CLAREMONT AVE., CHICAGO, ILL.

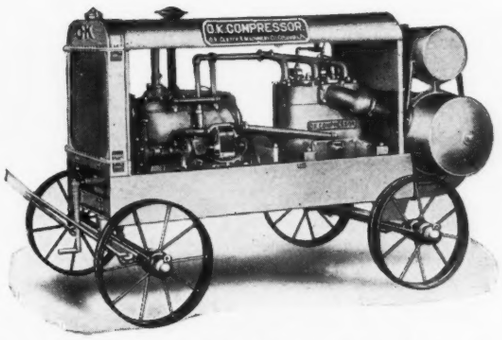
Representatives from Coast to Coast

Greater Capacity the O. K. Way

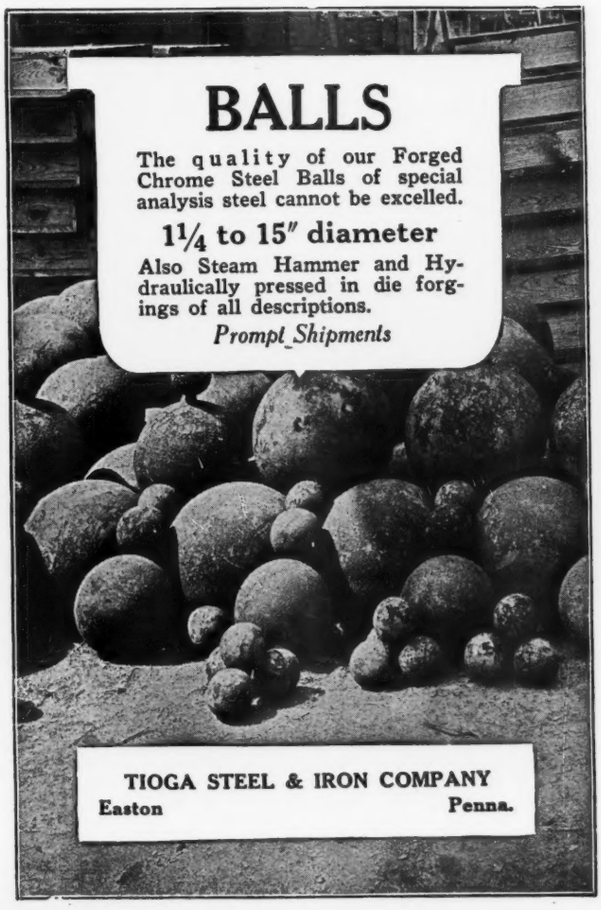
O. K. PORTABLE AIR COMPRESSORS will give you greater capacity than you can buy anywhere in a machine of near size and price. Extremely simple operation, less fuel, low costs. Fewer repairs required. Several sizes, gasoline or electrical power.

Gasoline or electric O. K. Hoists will help increase your profits by reducing your overhead.

Write for the whole story.



O. K. Clutch & Machinery Co.
Box 305, COLUMBIA, PA.



BALLS

The quality of our Forged Chrome Steel Balls of special analysis steel cannot be excelled.

1¼ to 15″ diameter

Also Steam Hammer and Hydraulically pressed in die forgings of all descriptions.

Prompt Shipments

TIOGA STEEL & IRON COMPANY
Easton Penna.

Why do they do it?

You know most of these concerns—leaders in their lines—and all using HEISLER Locomotives:

Bessemer Limestone & Cement Co., International Cement Corporation, Solvay Process Co., Snow Storm Silver Lead Co., United Electric Coal Co., Atlantic Gypsum Products Co., Electric Shovel Coal Corporation, Lukens Steel Co., Lehigh Coal & Navigation Co., Central Iron & Coal Co., Sherwood-Templeton Coal Co., International Shoe Co., Weyerheauser Timber Co., Hammermill Paper Co., Harleigh-Brockwood Coal Co.

These— and many more such "top-notchers" — are hauling *at least 30% more tonnage* with Heislers, at a lower cost-per-ton.

Why can't *you* get just as good results?

YOU CAN! Write us, and we'll tell you how the HEISLER is put on your work to prove its Bigger Capacity *by actual results*. The demonstration costs you nothing. *Mail the coupon.*

HEISLER LOCOMOTIVE WORKS
Erie, Pennsylvania, U. S. A.

HEISLER
GEARED LOCOMOTIVES
Steam, Gas-Electric, Diesel-Electric

Hauling above their guaranteed capacity— mail the coupon for an idea of the improvements the Heisler will make on your work.

156

HEISLER LOCOMOTIVE WORKS, Erie, Pa.
Gentlemen:

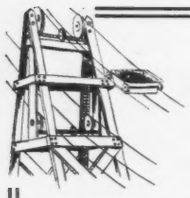
Please send us by return mail your proposition on the Heisler Locomotive, to put it on our work with a definite guarantee to haul at least 30% more material per ton of locomotive.

(*Your Name*).....

(*Company Name*).....

(*Address*).....

NOTE:
We are now using ....ton locomotive of.....(*type*).



You Can Always

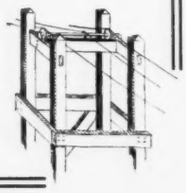
"PUT IT OVER"

With an Automatic Aerial Tramway

When a hauling or transportation problem presents seemingly insurmountable obstacles an Automatic Aerial Tramway usually can be chosen as the simplest, most economical means of overcoming every difficulty.

Automatic Aerial Tramways are handling large tonnage for Quarries, Mines, Standard Gravel Pits, and many others—quickly, steadily, and at low cost. Complete operation may be automatic if desired.

Find out how an Automatic Aerial Tramway will reduce your haulage costs. Complete, interesting details on request.



INTERSTATE EQUIPMENT CORPORATION

25 CHURCH ST., NEW YORK CITY

LORENSON-MATTHEWS Mfg. Co.

The house of good steel work

To the right is a rectangular bin, a typical piece of Lorenson-Matthews construction.

OUR specialty is the design and construction of every kind of equipment, made of sheet metal and steel, for use in the stone products industry.

Years of experience in making chutes, buckets, cars, conveyor troughs and flights, loading booms, screens, etc., admirably equips us to build similar devices for your plant. Moreover, it is a guarantee that we can render more accurate estimates of cost and delivery than would otherwise be possible.

Designs and estimates will be promptly submitted at your request. Write us for full details.

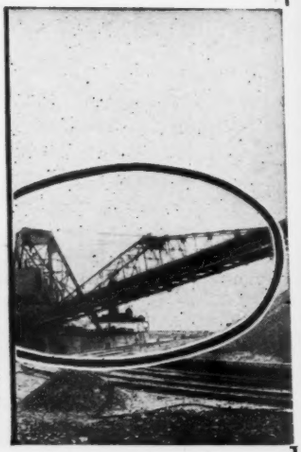
Lorenson-Matthews Mfg. Co.

DICKSON CITY, PA.

New York City Representative — E. H. DuVivier, 30 Church St.

Self-Unloading Vessels Built or Converted

The Leathem D. Smith Dock Co. are pioneers in the self unloading vessel field. The Leathem D. Smith patented design of self-unloading vessel increases capacity 10-20% and lowers center of gravity as much as 2-3 ft. over those of other builders. The Engineering Department will be glad to work out your problems relative to the design, construction, and equipment of self-unloading vessels.



LEATHEM D. SMITH DOCK COMPANY

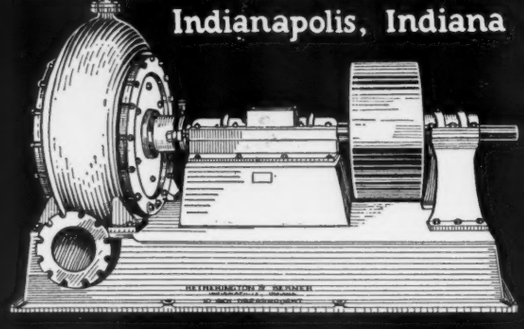
Sturgeon Bay, Wisconsin

Engineer's Building - Chicago, Ill.

H & B Pumps Produce More Yards per Dollar Operating and Maintenance Cost than any other Pump on the Market

HETHERINGTON & BERNER

Indianapolis, Indiana



SCHULTHESS HYDRATOR

Assures Perfect Hydration of Lime as Evidenced by 35 Plants Installed During Past Three Years

Made by pioneers who have specialized in the designing of lime plants and lime plant equipment for years SCHULTHESS HYDRATORS are so highly developed that no preliminary crushing of lime is necessary, while an absolutely DUST-LESS operation is assured. The continuous even flow of hydrate is most economically accomplished—as verified by the superior results being obtained in the plants now in operation.

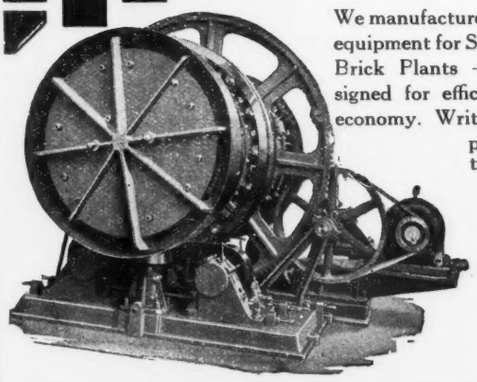
SCHULTHESS HYDRATORS are built in SIX SIZES. Write for detailed description and prices.

McGANN MANUFACTURING COMPANY inc.
Engineers & Manufacturers
Chicago YORK, PA. New York

Cutting Costs in Half

Jackson and Church ROD MILLS combine two operations in one—the grinding of coarse sand, and the mixing with lime. This low cost feature is a big advantage in the production of Sand-Lime-Brick.

We manufacture complete equipment for Sand-Lime-Brick Plants — all designed for efficiency and economy. Write for complete details.



JACKSON & CHURCH Company
SAND LIME BRICK MACHINERY SAGINAW, MICH U. S. A.

ENGINEERS & BUILDERS
of
CEMENT PLANTS
STONE CRUSHING PLANTS
LIME PLANTS
AND ALL TYPES OF INDUSTRIAL BUILDINGS LARGE OR SMALL

BURRELL
ENGINEERING & CONSTRUCTION CO.
21st FLOOR
DAILY NEWS PLAZA
CHICAGO ILLINOIS

The AMERICAN
GOPHER
SHOVEL

Fast, strong in every part, embodying all proved features; the «GOPHER» is the kind of shovel the experienced shovel user would build if he had the know-how and equipment to build the kind of shovel his long experience tells him he needs.

Quality Engineering

AMERICAN
HOIST & DERRICK CO.
Saint Paul, Minnesota

CROSS

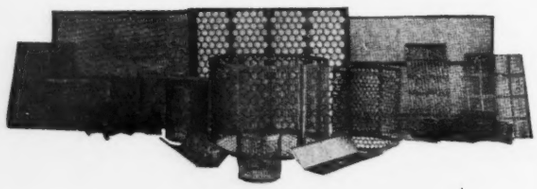
PERFORATED METAL SCREENS

Cross Screen Plates and Sections are not just "good enough;" but as good as they can be made.

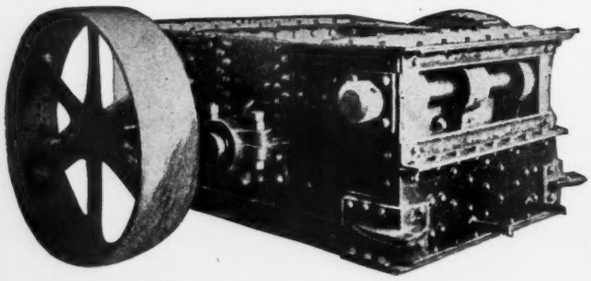
They are shipped in the time you request. An immense stock of material insures speed when time means money.

We also make Elevator Buckets of the same high quality and prompt service.

Catalog on request



CROSS
ENGINEERING COMPANY
Carbondale, Pa.



A Most Successful Crusher

Ocala Single Roll Crushers have performed successfully for more than twenty years. Very low first cost, very low operating cost, fewer fines and dust. Rolls and breaking plates are made of a special chilled iron mixture which guarantees longer life. Sizes from 18 x 24 inches to 30 x 60 inches.

SAND PUMPS We also manufacture pumps 8 inch and 10 inch in size.

Let our experience help you. Write for complete details.

OCALA IRON WORKS
Ocala, Florida

This EAGLE "SWINTEK" Installation shows *Convincing Results*

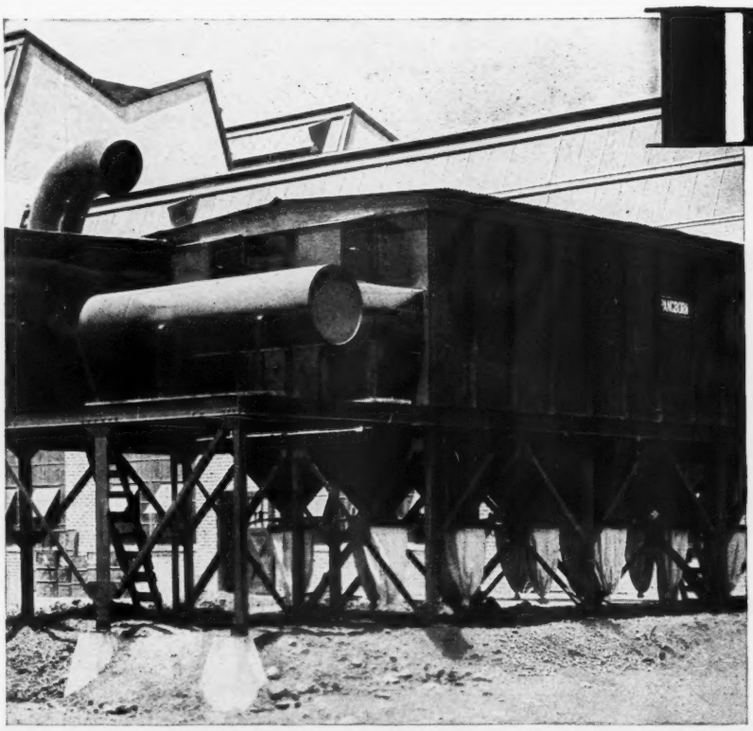
The Eagle "Swintek" Screen Nozzle Ladder at the A. J. Clementz's Sons plant at Massillon, Ohio, in the convincing results of its operation, has prompted this firm to say that the purchase of this machine was "one of the best investments we ever made."

They run continuously through the day without clogging the line and cave-ins do not choke the nozzle because of the chain agitation. They easily pump a 70-ton car of gravel in twenty minutes with a ten-inch pump, to say nothing of the sand that is screened out.

Steady production, positive digging and agitation, higher capacities, trouble free operation; these are the "convincing results" of an Eagle "Swintek" installation.

Write for our descriptive bulletin.

EAGLE IRON WORKS 129 Holcomb **Des Moines, Ia.**



DUST COLLECTORS

Whether your Dust problem is confined to one machine . . . whether it involves thousands of cubic feet of shop space . . . Pangborn Engineers are ready to serve you . . . BRING your Dust problem to Pangborn. . . .

PANGBORN

HAGERSTOWN, MD.

WHEN BETTER AIR SEPARATORS ARE BUILT, GAYCO BUILDS THEM

MODELS "TWENTY-SEVEN" and "TWENTY-EIGHT"
GAYCO CENTRIFUGAL SEPARATORS
REPRESENTS ANOTHER GAYCO ADVANCE IN AIR SEPARATOR PRACTICE

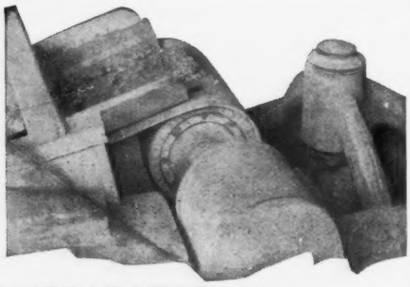
The GAYCO PATENTED method of sizing by CENTRIFUGAL FORCE has been perfected and the mechanical construction improved, giving greater capacity, cleaner tailing and higher efficiency than is possible with any other Air Separator.

Quick, Positive Adjustments for hundreds of different meshes.
Perfect, Automatic Lubrication without any oil waste.
Steep Angle Cones which prevent material from building up and choking.

NO DAMPERS — NO CHOKE DEFLECTORS — NO OIL-CUPS — NO GREASE-CUPS

RUBERT M. GAY COMPANY, INC., 114 Liberty St., New York, N.Y.
THE ONLY LOW VELOCITY AIR SEPARATOR WHICH SIZES BY CENTRIFUGAL FORCE

Protect your crushers



DINGS MAGNETIC SEPARATOR CO.
670 SMITH STREET MILWAUKEE, WISCONSIN
Established in 1899
The world's largest manufacturer of magnetic separators
New York City 30 Church Street
Boston 304 Rice Building
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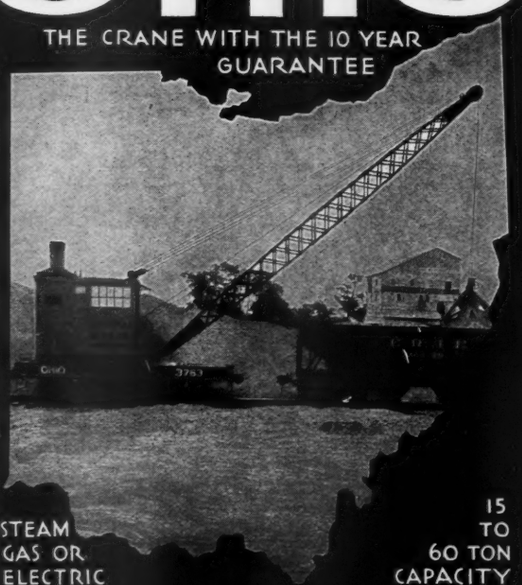
A Dings magnetic separator will positively stop tramp iron from reaching your crushers. Traps fill with rock and let the metal slide by; spring devices at their best only partially soften the blow.

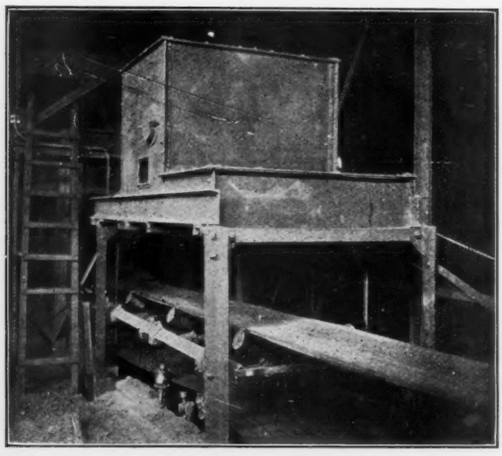
A Dings separator absolutely throws aside every particle of metal. None can pass. How much of the $2,100,000 yearly repair bill on crusher equipment belongs in your plant? A Dings magnetic separator will stop most of it and pay for itself in a few months time.

OHIO
THE CRANE WITH THE 10 YEAR GUARANTEE



STEAM GAS OR ELECTRIC
15 TO 60 TON CAPACITY

LOCOMOTIVE CRANES
GANTRY CRANES, BARGE CRANES, BALLAST CRANES, ERECTION AND LOGGING CRANES
CRAWLER CRANES AND SHOVELS
The Ohio Locomotive Crane Company
BUCYRUS, OHIO



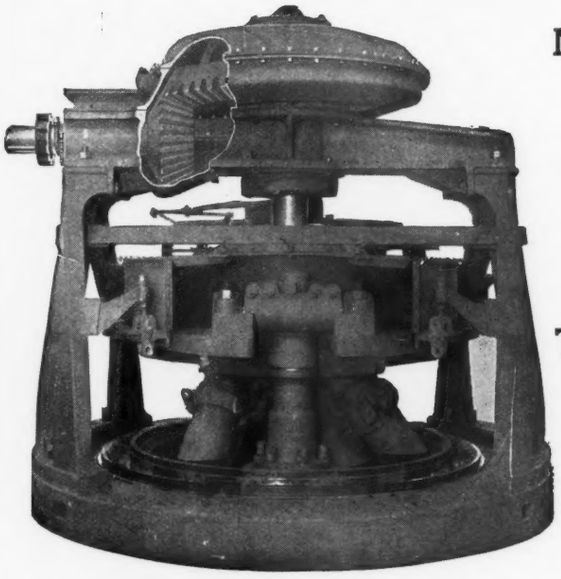
The Merrick Conveyor
WEIGHTOMETER!

Will weigh within a guaranteed accuracy of 99% any material passing over a conveyor upon which it is installed, and doing it without additional handling, expensive labor, or loss of time.
Weightometers are ideal for weighing stone, gravel, sand, coal and hundreds of other conveyor-handled products.
When properly installed it does its work faithfully and correctly—requires little attention. Write for full details.

MERRICK SCALE MFG. COMPANY
PASSAIC, NEW JERSEY

Open Circuit - Closed Circuit - or Both

The inherent advantages of the BRADLEY HERCULES tube mill combination guarantee results unapproached by any other grinding system.



Maximum Capacities—

BRADLEY HERCULES MILLS are grinding in normal open-circuit operation 50 to 60 tons of cement rock and 250 bbls. of dry-process clinker per mill hour, to the proper fineness for tube mill feed, enabling tube mills in open-circuit to produce a higher fineness than is possible with any other open-circuit system.

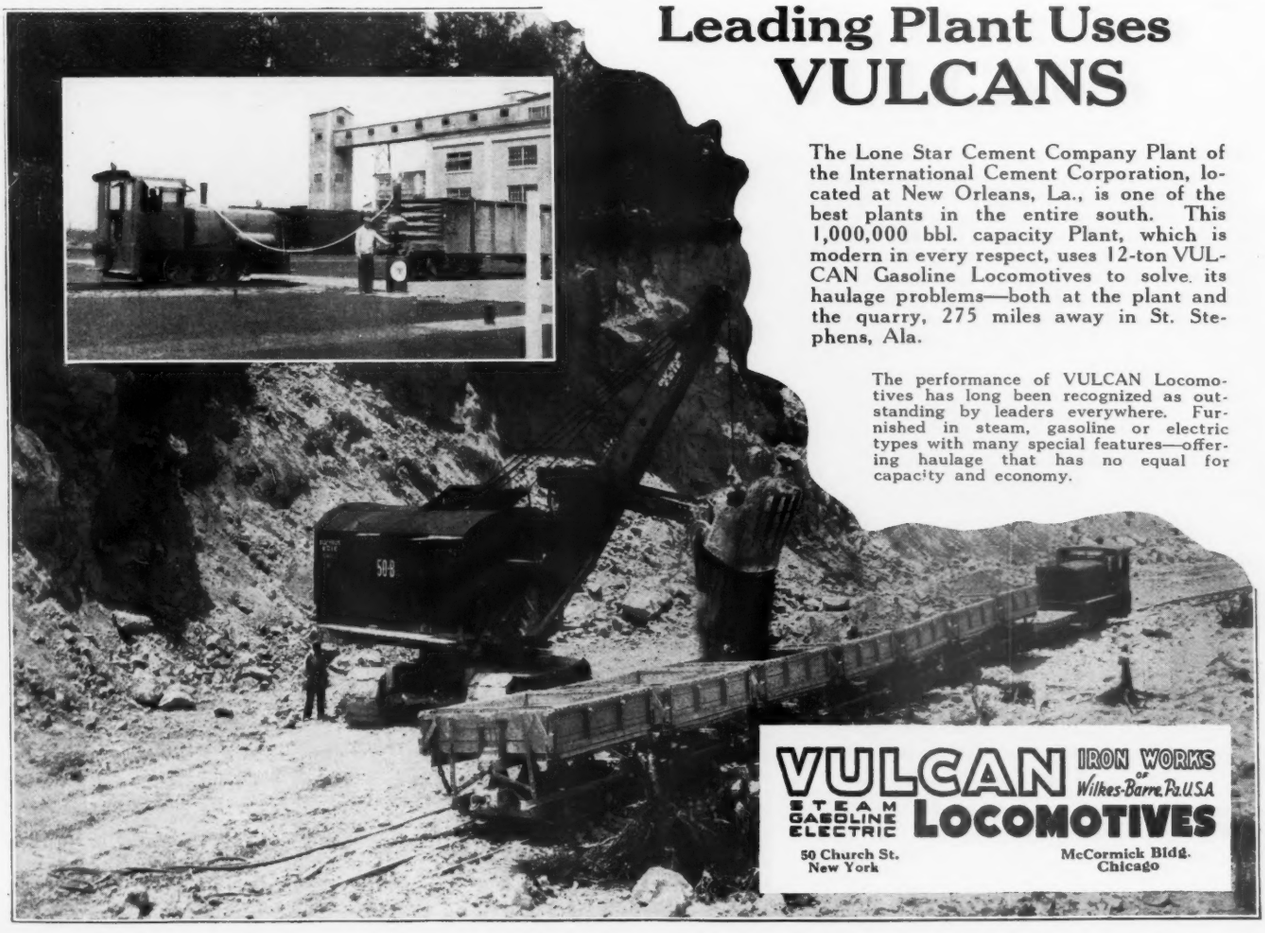
The Ultimate in Fineness—

Obtained by close circuiting the tube mill, increasing tube mill capacity beyond that obtained in normal operation.

We are prepared to make recommendations based upon first-hand information.

BRADLEY PULVERIZER COMPANY

Boston London Allentown, Pa.



Leading Plant Uses VULCANS

The Lone Star Cement Company Plant of the International Cement Corporation, located at New Orleans, La., is one of the best plants in the entire south. This 1,000,000 bbl. capacity Plant, which is modern in every respect, uses 12-ton VULCAN Gasoline Locomotives to solve its haulage problems—both at the plant and the quarry, 275 miles away in St. Stephens, Ala.

The performance of VULCAN Locomotives has long been recognized as outstanding by leaders everywhere. Furnished in steam, gasoline or electric types with many special features—offering haulage that has no equal for capacity and economy.

VULCAN IRON WORKS of Wilkes-Barre, Pa. U.S.A.
STEAM GASOLINE ELECTRIC LOCOMOTIVES
50 Church St. New York
McCormick Bldg. Chicago

PIT AND QUARRY

Research Department

538 South Clark St., Chicago, Ill.

Please send me catalogs and prices concerning the following items checked below:

- ☐Agitators, sand and Gravel
- ☐Agitators, Slurry
- ☐Air cleaners
- ☐Air compressors
- ☐Bag filling and weighing machinery
- ☐Bags, cloth
- ☐Bags, paper
- ☐Balls, steel
- ☐Barges, steel
- ☐Belt dressing
- ☐Belt fasteners
- ☐Belting, conveyor and elevator
- ☐Belting, transmission
- ☐Belt lacing
- ☐Belt plates
- ☐Belt rivets
- ☐Belt tighteners
- ☐Bin gates
- ☐Bins, concrete
- ☐Bins, steel
- ☐Blasting supplies
- ☐Blasting powder
- ☐Blocks, friction
- ☐Boats, self-unloading
- ☐Bodies, Motor Trucks
- ☐Brake Linings
- ☐Buckets, Clamshell
- ☐Buckets, Conveyor and Elevator
- ☐Buckets, Dragline
- ☐Buckets, Orange Peel
- ☐Cableways, Slackline
- ☐Calcining Machinery
- ☐Car Dumpers
- ☐Car Pullers and Movers
- ☐Carriers, Belt
- ☐Cars, Dump
- ☐Cars, Kiln
- ☐Castings, Manganese Steel
- ☐Castings, Steel
- ☐Chains, Conveyor and Elevator
- ☐Chains, Power Shovel, Crane and Dredge
- ☐Chains, Transmission
- ☐Chutes
- ☐Classifiers
- ☐Clips, Wire Rope
- ☐Clutches
- ☐Clutches, Magnetic
- ☐Concrete Plants, Ready Mixed
- ☐Cones, Washing
- ☐Conveyors, Apron
- ☐Conveyors, Belt
- ☐Conveyors, Pneumatic
- ☐Conveyors, Screw
- ☐Conveyors, Skip
- ☐Coolers
- ☐Couplings, Flexible
- ☐Couplings, Hose
- ☐Cranes, Locomotive
- ☐Cranes, Overhead Traveling
- ☐Cranes, Truck
- ☐Crushers, Cone
- ☐Crushers, Disc
- ☐Crushers, Gyratory
- ☐Crushers, Hammer
- ☐Crushers, Jaw
- ☐Crushers, Ring
- ☐Crushers, Roll
- ☐Crushers, Rotary
- ☐Cutter Heads, Dredging
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- ☐Draglines, Revolving Boom
- ☐Dredges, Dipper
- ☐Dredges, Hydraulic
- ☐Dredges, Ladder
- ☐Drill Sharpening Machinery
- ☐Drills, blast hole
- ☐Drills, Diamond Core
- ☐Drills, Hand Hammer
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- ☐Elevators, Bucket
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- ☐Engines, Oil
- ☐Feeders
- ☐Filters, Air
- ☐Filters, Oil
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- ☐Frogs and Switches
- ☐Fuses, Blasting
- ☐Gears
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- ☐Grinding Balls
- ☐Grizzlies
- ☐Guns, Hydraulic
- ☐Hoists, Air
- ☐Hoists, Derrick
- ☐Hoists, Drum
- ☐Hoists, Motor Truck Body
- ☐Hoists, Skip
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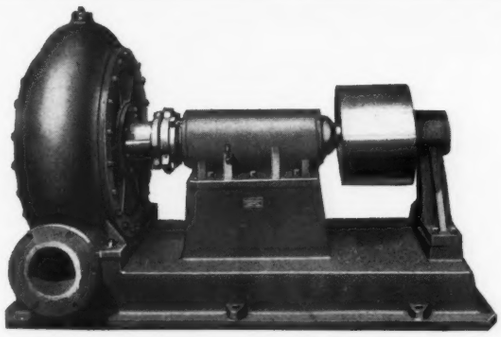

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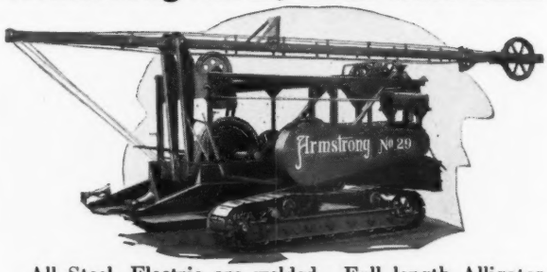

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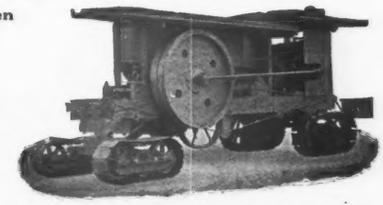

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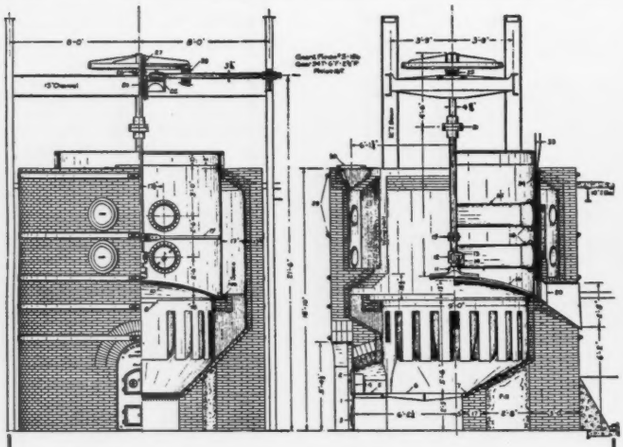

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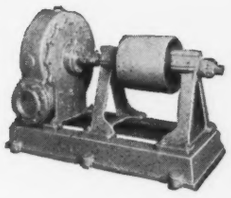

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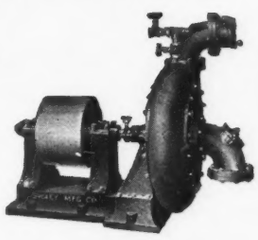

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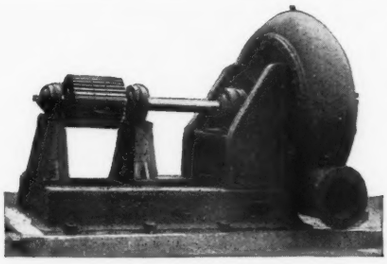

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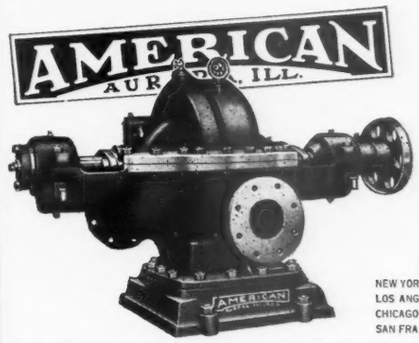

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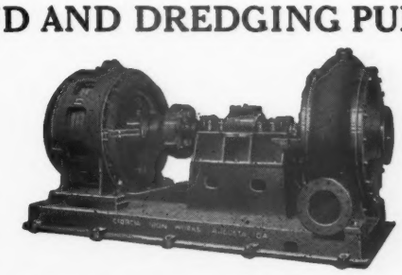

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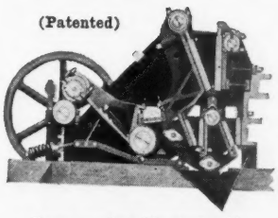

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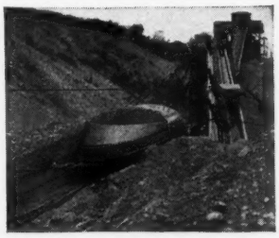

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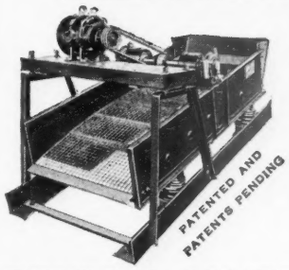

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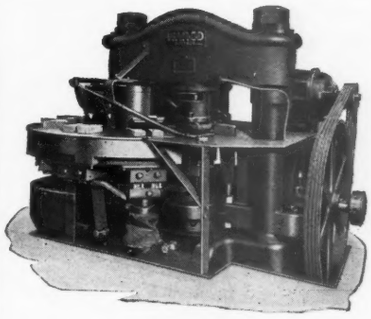

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Link-Belt Co.
Orton Crane & Shovel Co.
Owen Bucket Co.
Williams Co., G. H.

Buhr Mills
Ehrsam & Sons Mfg. Co., J. B.

Cableways
American Steel & Wire Co.
Broderick & Bascom Rope Co.
Interstate Equipment Corp.
Link-Belt Co.
Roebling's Sons Co., John A.
Sauerman Bros. (Slackline)

Calcining Kettles (Gypsum)
Ehrsam & Sons Mfg. Co., J. B.

Capstans (See Winches and Capstans)

Car Dumpers
Seaverns Co., Jas. B.

Car Pullers
Stephens-Adamson Mfg. Co.
Webster Mfg. Co.

Carriers
Smith Engineering Works
Sprout-Waldron Co.
Stephens-Adamson Mfg. Co.
Webster Mfg. Co.
Welch Eng. Service, F. M.

Cars (Dump)
Koppel Industrial Car and Equip. Co.
Lorenson-Matthews Mfg. Co.
National Equipment Corp. (Insley Division)

Cars (Industrial)
Koppel Industrial Car and Equip. Co.
Lorenson-Matthews Mfg. Co.
National Equipment Corp. (Insley Division)

Car Wheels (See Wheels—Car)

Castings
Bacon, Inc., Earle C.
Briggs, Wm. C.
Eagle Iron Works
Kennedy-Van Saun Mfg. and Eng. Corp.
Link-Belt Co.
National Malleable & Steel Castings Co.
Norbom Engineering Co.
Riddell Co., W. A.
Rogers Iron Works Co.

Cement Pumps (See Pumps; Air Pumps)

Central Mixing Plants
National Equipment Corp. (T. L. Smith Division)

Chain (Dredge and Steam-Shovel)
Bucyrus-Erie Co.
Jeffrey Mfg. Co.
National Malleable & Steel Castings Co.

Chain (Elevating and Conveying)
Chain Belt Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Norbom Engineering Co.
Riddell Co., W. A.
Stephens-Adamson Mfg. Co.
Webster Mfg. Co.

Chain Drives
Link-Belt Co.

Chain Links
Bucyrus-Erie Co.

Chutes and Chute Liners
Cross Engineering Co.
Lorenson-Matthews Mfg. Co.
Morrow Mfg. Co.
National Equipment Corp. (Insley Division)
Rogers Iron Works Co.
Seaverns Co., Jas. B.
Webster Mfg. Co.

Clamshell Buckets (See Buckets—Clamshell, Orange-Peel, etc.)

Classifiers
Allen Cone and Machy. Corp.
Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machine Co.
Link-Belt Co.
Pangborn Corp.
Stephens-Adamson Mfg. Co.

Clips (Wire Rope)
American Hoist and Derrick Co.
American Steel & Wire Co.
Broderick & Bascom Rope Co.

Clutches
Chain Belt Co.
Link-Belt Co.
O. K. Clutch & Machinery Co.
Webster Mfg. Co.

Coal-Pulverizing Equipment
Allis-Chalmers Mfg. Co.
Bradley Pulverizer Co.
Gay Co., Inc., Rubert M.
Kennedy-Van Saun Mfg. and Eng. Corp.
Pennsylvania Crusher Co.
Raymond Bros. Impact Pulv. Co.
Vulcan Iron Works

Compressors (See Air Compressors)

Concentrators (Slurry)
Deister Concentrator Co.

Cones (Sand-Washing)
Allen Cone Co.
Link-Belt Co.
Smith Engineering Works

DIAMOND RUBBER CO. INDUSTRIAL NEWS

It cost three cents a foot more —*but it lasted twice as long*

BACK in the year 1924, the user had on this installation, in the city of Washington, D. C., a brand of belt that had outworn all the other belts that had been tried.

In October of that year, as an experiment, 407 feet of Diamond Stacker Belt were hooked up with 407 feet of the belt that had proved itself best up to that time.

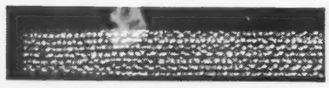
Service on this installation is severe, because of exposure to the weather, and also because of constant operation night and day. No belt had ever withstood more than one winter under these conditions.

The 407 feet of Diamond Stacker Belt wore out two 407-foot lengths of the competing brand, survived three winters, and handled nearly two million tons of material.

"What a whale of a difference" that three cents a foot did make!

Diamond Conveyor Belts are carried in stock at Akron in sizes 12″ 4-ply 1/16″ top cover to 36″ 6-ply 1/8″ top cover. They can be procured on short notice through your nearest Diamond Distributor. He can intelligently discuss your belting problems with you. Write us for his name, or use coupon below.

Diamond Conveyor Belts are different:



1. In the slow-aging rubber compounds used.
2. Flat-plied, not folded, fabric.
3. Edge cover "tied" to the belt with open-meshed fabric and special gum.

Diamond Rubber Chute Lining

A pure gum compound, having phenomenal strength and resistance to wear, with a stiff back 3/32″ thick, made of two fabric plies with a tough fibrous compound between. The stiff backing affords an anchorage for nails, screws, or bolts, so that the Chute Lining may be securely attached to any desired surface.

Recommended for lining chutes and conveyor skirt boards. Tougher than steel, it saves frequent replacement of metal parts. 1/4″, 3/8″ and 1/2″ in stock for immediate shipment.

Diamond

RUBBER BELTING · HOSE · PACKING

THE DIAMOND RUBBER CO., Inc.
AKRON, OHIO

Supplies the country from these eleven service centers

Akron Atlanta Kansas City New York
Philadelphia Boston Dallas Chicago
Los Angeles Seattle San Francisco

The Diamond Rubber Company, Inc., Akron, Ohio. P.Q.—3-30

Gentlemen: I am interested in ☐ Diamond Conveyor Belt ☐ Diamond Chute Lining. Send me the name of the Diamond Distributor in my locality.

Name.....

Firm name.....

Address.....

Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

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Contractors and Builders
Burrell Eng. & Const Co

Conveyor Belting (See Belting)

Conveyor Idlers and Rolls
Link-Belt Co.
Robins Conveying Belt Co.
Stephens-Adamson Mfg. Co.

Conveyors (Ready Mixed Concrete)
Clinton Motors Corp.
Good Roads Machinery Co.
Highway Truck Mixer Co.
Jaeger Machine Co.
Parke Concrete Carrier, Inc.
Transit Mixers, Inc.

Conveyors and Elevators
Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
Barber Greene Co.
Chain Belt Co.
Diamond Iron Works, Inc.
Fairfield Engineering Co.
Fuller Co.
Good Roads Machinery Co., Inc.
Haiss Mfg. Co., Inc., George
Industrial Brownhoist Corp.
Jeffrey Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
Link-Belt Co.
Lorenson-Matthews Mfg. Co.
McLanahan and Stone Machine Co.
Morrow Mfg. Co.
Robins Conveying Belt Co.
Rogers Iron Works Co.
Seaverns Co., Jas. B.
Smith Engineering Works.
Sprout-Waldron & Co.
Stearns Conveyor Co.
Stephens-Adamson Mfg. Co.
Traylor Eng. & Mfg. Co.
Universal Crusher Co.
Universal Road Machinery Co.
Webster Mfg. Co.
Welch Eng. Service, F. M.
Williams Patent Crusher & Pulverizer Co.

Coolers (See Kilns and Coolers—Rotary)

Correcting Basins
Smidth & Co., F. L.

Couplings (Hose, Pipe, etc.)
Cincinnati Rubber Mfg. Co.
Thermoid Rubber Co.

Cranes (Crawler and Locomotive)
American Hoist & Derrick Co.
Bay City Dredge Works
Bucyrus-Erie Co.
General Excavator Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Link-Belt Co.
Manitowoc Engineering Works
National Equipment Corp. (Insley Division)
National Equipment Corp. (Koehring Division)
National Equipment Corp. (Parsons Division.)
Ohio Locomotive Crane Co.
Ohio Power Shovel Co.
Orton Crane & Shovel Co.
Thew Shovel Co.

Cranes (Overhead Traveling Electric)
Harnischfeger Corp.
Industrial Brownhoist Corp.

Crusher Parts
Briggs, Wm. C.
Kennedy-Van Saun Mfg. and Eng. Corp.
Mid-West Steel Co
Rogers Iron Works Co.
Wheeling Mold & Fdry. Co.

Crushers (Cone)
Nordberg Mfg. Co.

Crushers (Hammer)
Allis-Chalmers Mfg. Co.
Dixie Machinery Mfg. Co.
Jeffrey Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Pennsylvania Crusher Co.
Sturtevant Mill Co.
Universal Crusher Co.
Williams Patent Crusher and Pulverizer Co.

Crushers (Jaw and Gyratory)
Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
Buchanan Co., C. G.
Diamond Iron Works, Inc.
Good Roads Machinery Co.
Kennedy-Van Saun Mfg. & Eng. Corp.
Lewistown Foundry & Machinery Co.
Nordberg Mfg. Co.
Rogers Iron Works Co.
Smith Engineering Works
Sturtevant Mill Co.
Traylor Eng. & Mfg. Co.
Universal Crusher Co.
Universal Road Machy. Co.
Western Wheeled Scraper Co.
Wheeling Mold & Fdry. Co.
Williams Patent Crusher & Pulverizing Co

Crushers (Rotary)
Allis-Chalmers Mfg. Co.
Ehrsam & Sons Mfg. Co., J. B
Sturtevant Mill Co.

Crushers (Roll)
Allis-Chalmers Mfg. Co
Bacon, Inc., Earle C.
Diamond Iron Works, Inc.
Jeffrey Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Link-Belt Co.
McLanahan-Stone Machine Co.
Ocala Iron Works
Pennsylvania Crusher Co.
Rogers Iron Works Co.

Crushing Rolls
Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
Buchanan Co., C. G.
Jeffrey Mfg. Co
Rogers Iron Works Co
Sturtevant Mill Co.
Traylor Eng. & Mfg. Co

Derricks and Derrick Fittings
American Hoist & Derrick Co.
Harnischfeger Corp.
National Equipment Corp. (Insley Division)

Diesel Engines (See Engines—Diesel)

Dippers and Teeth (Power-Shovel)
Bucyrus-Erie Co.
Harnischfeger Corp.
Koehring Co.
Orton Crane & Shovel Co.
Thew Shovel Co.

Dragline Cableway Excavators
American Hoist and Derrick Co.
Garst Mfg. Co.
Good Roads Machinery Co.
Link-Belt Co.
National Equipment Corp. (Inlsey Division)
Sauerman Bros.

Dragline Excavators
American Hoist and Derrick Co.
Bucyrus-Erie Co.
General Excavator Co.
Harnischfeger Corp.
Link-Belt Co.
Manitowoc Engineering Works
National Equipment Corp. (Insley Division)
National Equipment Corp. (Koehring Division)
Ohio Power Shovel Co.
Thew Shovel Co

Dredge Chain (See Chain)

Dredge Pipe (See Pipe)

Dredges
American Hoist and Derrick Co.
Bay City Dredge Works
Bucyrus-Erie Co
Hetherington & Berner, Inc.
Morris Machine Works
Norbom Engineering Co.
Randolph-Perkins Co.
Welch Eng. Service, F. M
Yuba Mfg. Co.

Drill-Sharpening Machines
Armstrong Mfg. Co.
Gardner-Denver Co.
Ingersoll-Rand Co.

Drilling Accessories
Armstrong Mfg. Co.
Ingersoll-Rand Co
Keystone Driller Co.
Loomis Machine Co

Drills (Blast-Hole)
Armstrong Mfg. Co.
Gardner-Denver Co.
Keystone Driller Co.
Loomis Machine Co.

Drills (Rock)
Gardner-Denver Co.
Ingersoll-Rand Co.

Drills (Well) (See Drills—Blast-Hole)

Dryers
Allis-Chalmers Mfg. Co.
Jones & Hartman, Inc.
Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdry & Mach. Co
McGann Mfg Co., Inc.
McLanahan and Stone Machine Co.
Prindle Mfg. Co., W. E.
Traylor Eng. & Mfg. Co.
Vulcan Iron Works

Dust Arresters
New Haven Sand Blast Co.
Northern Blower Co
Pangborn Corp.

Dust-Collecting Systems
Allis-Chalmers Mfg. Co.
Lorenson-Matthews Mfg. Co.
New Haven Sand Blast Co.
Northern Blower Co.
Pangborn Corp.
Raymond Bros. Impact Pulverizer Co.

Dust-Conveying Systems
Fuller Co.

Electrical Equipment
Allis-Chalmers Mfg. Co.
Westinghouse Electric & Mfg. Co.

Elevators (See Conveyors and Elevators)

Engineers
Allen Cone Co.
Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
Burrell Eng. & Const Co.
Caproni and Co., Leo F.
Fuller Co.
Hetherington & Berner, Inc.
Hunt Co., Robt. W.
Jones & Hartman, Inc.
Kennedy-Van Saun Mfg. and Eng. Corp.
Lackawanna Steel Const. Co
Long Co., M. A.
McLanahan and Stone Machine Co.
Meade & Co., Richard, K.
Pangborn Corp.
Randolph-Perkins Co.
Robins Conveying Belt Co.
Rogers Iron Works Co.
Smidth & Co., F. L.
Stephens-Adamson Mfg. Co.
Webster Mfg. Co.
Welch Eng. Service, F. M.
Yuba Mfg. Co.

Engines (Diesel)
Buda Co.
Power Mfg. Co.
Nordberg Mfg. Co.

Engines (Hoisting)
American Hoist and Derrick Co.
Flory Mfg. Co., S.

Engines (Internal-Combustion)
Buda Co.
Climax Eng. Co.
Hercules Motors Corp.
Ingersoll-Rand Co.
Le Roi Company
Nordberg Mfg. Co.
Novo Engine Co.
Power Mfg. Co.
Waukesha Motor Co.
Wisconsin Motor Mfg. Co.

Engines (Steam)
Ingersoll-Rand Co.
Morris Machine Works
Nordberg Mfg. Co.

Erectors
Lackawanna Steel Const. Co.

Excavating Machinery (See Shovels; Cranes; Buckets; etc.)

Exhaust Equipment
Pangborn Corp.

Explosives
Du Pont De Nemours & Co., E. I.
Keith Dunham Co.

Feeders
Allis-Chalmers Mfg. Co.
Diamond Iron Works, Inc.
Kennedy-Van Saun Mfg. and Eng. Corp.
Morrow Mfg. Co.
Pennsylvania Crusher Co.
Robins Conveying Belt Co.
Smith Engineering Works
Stephens-Adamson Mfg. Co.
Webster Mfg. Co.
Williams Patent Crusher & Pulverizer Co.

Filter Cloth
Oliver United Filters, Inc.

Filters (Cement Slurry)
Oliver United Filters Inc.

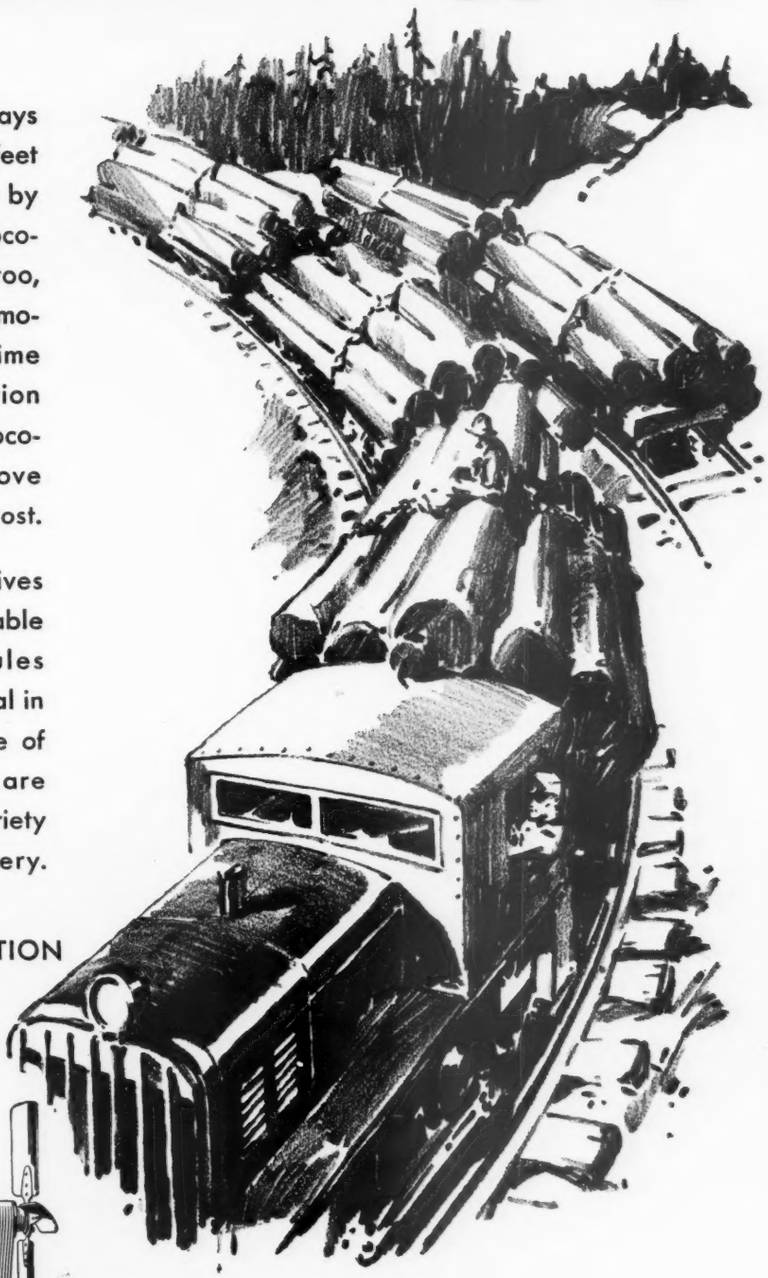
Forgings (Steel)
Harnischfeger Corp.
Vulcan Iron Works

Friction Blocks (Metallic)
Gatke, Thomas L.
Midland Asbestos Corp.

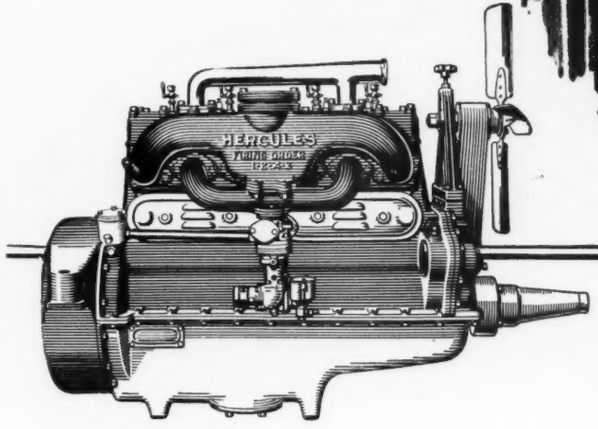
Hercules Power an Aid to Modern Logging

STEEL rails are replacing waterways in modern logging. Millions of feet of timber are hauled out each year by sturdy Hercules-Powered Vulcan locomotives. Many other industries, too, have found Hercules-Equipped locomotives invaluable. In quarries, in lime and gravel plants, on construction work and in private freight yards, locomotives powered by Hercules move materials quickly and at lowest cost.

Whether powering heavy locomotives and giant shovels or operating portable pumps and compressors, Hercules Engines are reliable and economical in service. Built in a complete range of sizes, from 13 to 115 H.P., they are standard equipment on a wide variety of heavy-duty industrial machinery.



HERCULES MOTORS CORPORATION
Canton, Ohio, U. S. A.
WEST COAST BRANCH: LOS ANGELES, CAL.
MID-CONTINENT BRANCH: TULSA, OKLA.



HERCULES ENGINES

Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

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Frogs and Switches
Buda Co.

Fuses (Detonating)
Ensign-Bickford Co.

Gaskets
Cincinnati Rubber Mfg. Co.
Diamond Rubber Co.
Midland Asbestos Corp.
Thermoid Rubber Co.

Gasoline Engines (See Engines—Internal-Combustion)

Gates (Bin) (See Bin Gates)

Gears, Herringbone
Bacon, Inc., Earle C.

Gears and Pinions
Bacon, Inc., Earle C.
Caldwell and Son Co., H. W.
Rogers Iron Works Co.
Stephens-Adamson Mfg. Co.
Vulcan Iron Works
Webster Mfg. Co.
Westinghouse Electric and Mfg. Co.

Generators (See Motors and Generators)

Glass Sand Equipment
Lewistown Foundry & Machine Co.

Grab Buckets (See Buckets—Clamshell, Orange-Peel, etc.)

Grinding Balls
Jeffrey Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Mid-West Steel Co.
Rogers Iron Works Co.
Tiogo Steel & Iron Co.

Grizzlies
Allis-Chalmers Mfg. Co.
Eagle Iron Works
Good Roads Machinery Co., Inc.
Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdy. & Mach. Co.
Manganese Steel Forge Co.
Robins Conveying Belt Co.
Rogers Iron Works Co.
Smith Engineering Works
Stephens-Adamson Mfg. Co.
Traylor Eng. & Mfg. Co.
Universal Road Machy. Co.

Guns (Hydraulic)
Taylor Forge & Pipe Works
Universal Nozzle Co.
Yuba Mfg. Co.

Gypsum Plaster Plants
Ehrsam & Sons Mfg. Co., J. B.

Hammer Mills (See Crushers—Hammer)

Hammers, Crusher (Renewable Tip)
Briggs, Wm. C.

Haulage Systems, Electric
Woodford Engineering Co.

Hoists
American Hoist & Derrick Co.
Curtis Pneumatic Machinery Co.
Flory Mfg. Co., S.
Gardner-Denver Co.
Harnischfeger Corp.
Ingersoll-Rand Co.
Link-Belt Co.
McLanahan and Stone Machine Co.
Novo Engine Co.
National Equipment Corp. (C. H. and E. Division)
Rogers Iron Works Co.
Sauerman Bros.
Smith Engineering Works
Vulcan Iron Works
Webster Mfg. Co.

Hose Couplings (See Couplings)

Hose (Air, Steam, and Water)
Cincinnati Rubber Mfg. Co.
Diamond Rubber Co.
Ingersoll-Rand Co.
Thermoid Rubber Co.

Hydrators (Lime)
Jackson & Church Co.
McGann Mfg. Co., Inc.
Vulcan Iron Works

Hydraulic Guns (See Guns—Hydraulic)

Idlers
Allis-Chalmers Mfg. Co.
Barber-Greene Co.
Fairfield Engineering Co.
Good Roads Machinery Co.
Link-Belt Co.
Robins Conveying Belt Co.
Smith Engineering Works
Stearns Conveyor Co.
Stephens-Adamson Mfg. Co.
Sprout Waldron & Co.
Webster Mfg. Co.
Weller Mfg. Co.

Kettles (Calcining)
Ehrsam & Sons Mfg. Co., J. B.

Kilns and Coolers (Rotary)
Allis-Chalmers Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
McGann Mfg. Co., Inc.
Smidth & Co., F. L.
Traylor Eng. & Mfg. Co.
Vulcan Iron Works

Kilns (Vertical)
McGann Mfg. Co., Inc.
Vulcan Iron Works

Kominuters (See Mills)

Lime-Handling Equipment
Fuller Co.
Link-Belt Co.
McGann Mfg. Co.
Raymond Bros. Impact Pulv. Co.

Lime and Hydrating Plants
Jones & Hartman, Inc.
McGann Mfg. Co., Inc.
Vulcan Iron Works

Linings (Ball- and Tube-Mill) (See Mill Liners and Linings)

Liquid Oxygen
Keith Dunham Co.

Loaders and Unloaders
Barber-Greene Co.
Bucyrus-Erie Co.
Good Roads Machinery Co., Inc.
Goodman Mfg. Co.
Haiss Mfg. Co., Geo.
Harnischfeger Corp.
Jeffrey Mfg. Co.
Link-Belt Co.
Nelson Iron Works
Robins Conveying Belt Co.
Stephens-Adamson Mfg. Co.

Locomotives (Electric, Gas, and Steam)
Brookville Locmotive Co.
Goodman Mfg. Co.
Heisler Locomotive Works
Jeffrey Mfg. Co.
Lima Locomotive Works
Porter Co., H. K.
Vulcan Iron Works
Westinghouse Electric and Mfg. Co.

Lubricants
Shaffer Oil & Refining Co.

Manganese Steel Castings
Manganese Steel Forge Co.
Riddell Co., W. A.

Mechanical Rubber Goods
Cincinnati Rubber Mfg. Co.
Diamond Rubber Co.
Thermoid Rubber Co.

Mill Liners and Linings (Iron for Ball and Tube Mills)
Jeffrey Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Smidth & Co., F. L.

Mills (Grinding) (See also Crushers—Hammer)
Allis-Chalmers Mfg. Co.
Bradley Pulverizer Co.
Ehrsam & Sons Mfg. Co., J. B.
Ellis Mills Mfg. Co.
Jackson & Church Co.
Lewistown Fdy. & Mach. Co.
Raymond Bros. Impact Pulv. Co.
Rogers Iron Works Co.
Smidth & Co., F. L.
Traylor Eng. & Mfg. Co.

Mixers (Plaster, Fiber and Retarder)
Ehrsam & Sons Mfg. Co., J. B.

Motor Trucks
Clinton Motors Corp.

Motors and Generators
Allis-Chalmers Mfg. Co.
Westinghouse Electric & Mfg. Co.

Motors (Internal-Combustion) (See Engines—Internal-Combustion)

Nozzles (Hydraulic) (See Guns—Hydraulic)

Nozzles (Suction Screen)
Eagle Iron Works

Nuggets (Tube Mill Grinding)
Mid-West Steel Co.
Tioga Steel & Iron Co.

Oils (Lubricating)
Shaffer Oil & Refining Co.

Oxygen (Liquid) (See Liquid Oxygen)

Packings (Pump, Valve, etc.)
Cincinnati Rubber Mfg. Co.
Diamond Rubber Co.

Pawls (Safety)
Stephens-Adamson Mfg. Co.

Perforated Metals
Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
Chicago Perforating Co.
Cross Engineering Co.
Morrow Mfg. Co.
Rogers Iron Works Co.
Standard Stamping & Perforating Co.

Pipe
Fremont Foundry and Machine Co.
Taylor Forge & Pipe Works

Pipe Flanges
Fremont Foundry and Machine Co.
Georgia Iron Works
Taylor Forge and Pipe Works

Plug Valves (See Valves)

Pneumatic Drills (See Drills)

Portable Conveyors
Barber-Greene Co.
Fuller Co.
Haiss Mfg. Co., Geo.
Link-Belt Co.
Robins Conveying Belt Co.
Stephens-Adamson Mfg. Co.

Portable Engines (See Engines—Internal Combustion)

Portable Loaders (See Loaders and Unloaders)

Pulleys (Magnetic)
Dings Magnetic Separator Co.

Pulverized Fuel Systems
Bradley Pulverizer Co.
Gay Co., Rubert M.
Jones & Hartman, Inc.
Kennedy-Van Saun Mfg. & Eng. Corp.
Raymond Bros. Impact Pulverizer Co.

Pulverizers (See also Crushers; Mills; etc.)
Allis-Chalmers Mfg. Co.
Bethlehem Steel Co.
Bradley Pulverizer Co.
Dixie Machinery Mfg. Co.
Jeffrey Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
Raymond Bros. Impact Pulverizer Co.
Smidth & Co., F. L.
Sturtevant Mill Co.
Universal Crusher Co.

Pumps (Acid Centrifugal)
Ingersoll-Rand Co.
Oliver United Filters, Inc.

Pumps (Air-Lift)
Fuller Co.
Ingersoll-Rand Co.

Pumps (Cement-Slurry)
Fuller Co.
Ingersoll-Rand Co.
Morris Machine Works.
Smidth & Co., F. L.

Pumps (Centrifugal)
Allis-Chalmers Mfg. Co.
American Well Works
Chain Belt Co.
Erie Pump & Engine Works
Fremont Foundry and Machine Co.
Georgia Iron Works
Hetherington & Berner, Inc.
Ingersoll-Rand Co.
Morris Machine Works
National Equipment Corp. (C. H. and E. Division)
Novo Engine Co.
Swaby Mfg. Co.

Pumps (Sand and Gravel)
Allis-Chalmers Mfg. Co.
American Well Works
Erie Pump & Engine Works
Fremont Foundry and Machine Co.
Georgia Iron Works
Hetherington & Berner, Inc.
Ingersoll-Rand Co.
Kansas City Hay Press Co.
Morris Machine Works
Norbom Engineering Co.
Ocala Iron Works
Swaby Mfg. Co.

For Stock-Pile Work

in Stone, Sand or Gravel

NELSON Q-7 LOADER

on McCormick Tractor

A HE-MACHINE

with plenty of power to tackle the toughest jobs.

ONE MAN RUNS IT

and it cleans up as it goes, without a lot of shovel labor.

LOADS 2 YARDS A MINUTE

Saves loading time and keeps the trucks on the road earning money.

BUILT BIG TO LOAD BIG TRUCKS

with plenty of height and reach to fill up the front of the truck.

Low First Cost

Low Operating Cost

Low Maintenance

The N. P. NELSON IRON WORKS, Inc.

824 Bloomfield Avenue :: Passaic, N. J.

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Ready-Mixed Concrete Plants
National Equipment Corp. (T. L. Smith Division)

Rock Drills (See Drills—Rock)

Rod Mills
Jackson & Church Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Traylor Eng. & Mfg. Co.

Rope (Wire) (See Wire Rope)

Safety Appliances
Pangborn Corp.

Sand-Blast Equipment
Pangborn Corp.

Sand-Lime Brick Machinery
Jackson & Church Co.
Riddell Co., W. A.
Rogers Iron Works Co.

Sand Separators
Allen Cone Co.
Smith Engineering Works
Stephens-Adamson Mfg. Co.

Sand-Settling Tanks
Allen Cone Co.
Good Roads Machinery Co.
Link-Belt Co.
Smith Engineering Works
Stephens-Adamson Mfg. Co.
Welch Eng. Service, F. M.

Scrapers (Power Drag)
Garst Mfg. Co.
Link-Belt Co.
Sauerman Bros.
Schofield-Burkett Const. Co.

Screens
Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
Chain Belt Co.
Chicago Perforating Co.
Cleveland Wire Cloth & Mfg. Co.
Cross Engineering Co.
Deister Concentrator Co.
Deister Machine Co.
Diamond Iron Works, Inc.
Eagle Iron Works
Ehrsam & Sons Mfg. Co., J. B.
Gay Co., Inc., Rubert M.
Good Roads Machinery Co.
Haiss Mfg. Co., Inc., George
Industrial Brownhoist Corp.
Jeffrey Mfg. Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Kent Mill Co.
Lewistown Foundry & Machinery Co.
Link-Belt Co.
Lorenson-Matthews Mfg. Co.
McLanahan-Stone Machine Co.
Manganese Steel Forge Co.
Morrow Mfg. Co.
Robins Conveying Belt Co.
Rogers Iron Works Co.
Sprout, Waldron & Co.
Smith Engineering Works
Standard Stamping & Perforating Co.
Stearns Conveyor Co.
Stephens-Adamson Mfg. Co.
Sturtevant Mill Co.
Traylor Eng. & Mfg. Co.
Tyler Co., W. S.
Universal Crusher Co.
Universal Road Machinery Co.
Universal Vibrating Screen Co.
Webster Mfg. Co.
Welch Eng. Service, F. M.

Screens (Vibrating or Shaking)
Deister Concentrator
Deister Machine Co.
Diamond Iron Works, Inc.
Gay Co., Inc. Rubert M.
Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
Link-Belt Co.
McLanahan and Stone Machine Co.
Niagara Roller Bearing Screens
Productive Equipment Corp.
Robins Conveying Belt Co.
Rogers Iron Works Co.
Stephens-Adamson Mfg. Co.
Sturtevant Mill Co.
Tyler Co., W. S.
Universal Vibrating Screen Co.

Separators (Air) (See Air Separators)

Separators (Magnetic)
Dings Magnetic Separator Co.

Separators (Slurry)
Smidth & Co., F. L.

Sheaves
Allis-Chalmers Mfg. Co.
American Hoist & Derrick Co.
Eagle Iron Works
Haiss Mfg. Co., Geo.
Hetherington & Berner
Rogers Iron Works Co.
Sprout-Waldron Co.
Stephens-Adamson Mfg. Co.
Vulcan Iron Works
Webster Mfg. Co.

Shovels (Electric, Internal-Combustion, and Steam)
American Hoist & Derrick Co.
Bay City Dredge Works
Bucyrus-Erie Co.
General Excavator Co.
Goodman Mfg. Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Link-Belt Co.
Manitowoc Engineering Works
National Equipment Corp. (Insley Division)
National Equipment Corp. (Koehring Division)
Ohio Power Shovel Co.
Orton Crane and Shovel Co.

Silos
Burrell Eng. & Constr. Co.
Smidth & Co., F. L.

Skip Hoists and Skips
Allis-Chalmers Mfg. Co.
American Hoist and Derrick Co.
Link Belt Co.
National Equipment Corp. (Insley Division)
Robins Conveying Belt Co.
Stephens-Adamson Mfg. Co.
Webster Mfg. Co.
Welch Eng. Service, F. M.

Sleeves (Dredge)
Cincinnati Rubber Mfg. Co.
Diamond Rubber Co.
Thermoid Rubber Co.

Speed Reduction Units
Bacon, Inc., Earle C.
Link-Belt Co.
Stephens-Adamson Mfg. Co.
Westinghouse Electric and Mfg. Co.

Spouts (See Chutes and Chute Liners)

Sprockets and Chain
Jeffrey Mfg. Co.
Link-Belt Co.

Steel Plate Construction
Lorenson-Matthews Mfg. Co.
Seaverns Co., Jas. B.
Sprout-Waldron & Co.
Webster Mfg. Co.

Storage Equipment
Sauerman Bros.
Stephens-Adamson Mfg. Co.

Tanks (Sand-Settling)
Allen Cone Co.
Good Roads Machinery Co.
Link-Belt Co.
Morrow Mfg. Co.
Smith Engineering Works
Stephens-Adamson Mfg. Co.
Webster Mfg. Co.
Welch Eng. Service, F. M.

Tools (Drill) (See Drilling Accessories)

Track Shifters
Nordberg Mfg. Co.

Tractors
Allis-Chalmers Mfg. Co.
Caterpiller Tractor Co.

Tramways (Aerial)
American Steel & Wire Co.
Broderick & Bascom Rope Co.
Interstate Equipment Corp.
Roebling's Sons Co., John A.
Williamsport Wire Rope Co.

Transformers
Allis-Chalmers Mfg. Co.
Westinghouse Electric and Mfg. Co.

Transmission Belting
Cincinnati Rubber Mfg. Co.
Diamond Rubber Co.
Thermoid Rubber Co.

Transmission Machinery
Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Bacon, Inc., Earle C.
Chain Belt Co.
Link-Belt Co.
Sprout-Waldron & Co.
Stearns Conveyor Co.
Stephens-Adamson Mfg. Co.
Webster Mfg. Co.

Trippers
Good Roads Machinery Co.
Link-Belt Co.
Robins Conveying Belt Co.
Sprout-Waldron & Co.
Stephens-Adamson Mfg. Co.

Truck Cranes (See Cranes)

Tube Mills (See Mills—Ball, Tube, etc.)

Tube-Mill Liners (See Mill Liners and Linings)

Turbines (Deep-Well)
American Well Works

Underground Loaders
Allis-Chalmers Mfg. Co.
Bucyrus-Erie Co.
Thew Shovel Co.

Unloaders (Box-Car)
Link-Belt Co.
Stephens-Adamson Mfg. Co.

Valves (Pump)
Cincinnati Rubber Mfg. Co.
Taylor Forge & Pipe Works

Variable Speed Reducers or Transmissions
Stephens-Adamson Mfg. Co.

Ventilating Apparatus
Pangborn Corp.

Vibrating Screens (See Screens—Vibrating)

Washers (Sand, Gravel, and Stone)
Allen Cone and Machy. Corp.
Allis-Chalmers Mfg. Co
Bacon, Inc., Earle C.
Diamond Iron Works, Inc.
Eagle Iron Works
Good Roads Machinery Co.
Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
Link-Belt Co.
McLanahan-Stone Machinery Co.
Perfect Classifier Co.
Smidth & Co., F. L.
Smith Engineering Works
Stephens-Adamson Mfg. Co.
Traylor Eng. & Mfg. Co.
Universal Road Machinery Co.
Welch Eng. Service, F. M.

Weighing Equipment (Automatic)
Merrick Scale Mfg. Co.
Schaffer Poidometer Co.
Webster Mfg. Co.

Welding Supplies
American Steel & Wire Co.
Manganese Steel Forge Co.
Roebling's Sons Co., John A.

Well Drills (See Drills—Well)

Wheels (Car)
Buda Co.
Eagle Iron Works
Rogers Iron Works Co.
Vulcan Iron Works

Winches and Capstans
Stephens-Adamson Mfg. Co.

Wire Cloth
Cleveland Wire Cloth & Mfg. Co.
Manganese Steel Forge Co.
Tyler Co., W. S.

Wire Rope
American Steel & Wire Co.
Broderick & Bascom Rope Co.
Roebling's Sons Co., John A.
Williamsport Wire Rope Co.

Wire-Rope Fittings
American Hoist and Derrick Co.
American Steel & Wire Co.
Broderick & Bascom Rope Co.
Roebling's Sons Co., John A.
Williamsport Wire Rope Co.

Wire-Rope Slings
American Steel & Wire Co.

Wire (Welding)
American Steel & Wire Co.

Worm Gears (See Gears and Pinions)

CHOOSE
your carriers WISELY...

What will they be
a year from now?

After a year's time in continous daily service your S-A carriers are just beginning to demonstrate their real stamina. One conveyor carrier may appear similar to another make, but performance is the deciding factor and the mechanically superior carrier commands the preference.

Into every S-A belt conveyor carrier is built ruggedness, ability to withstand strenuous continuous operation and smooth easy turning qualities that effectively conserve power.

Choose your conveyor carriers from the complete array of S-A designs provided for every belt conveyor whatever it may be required to handle.

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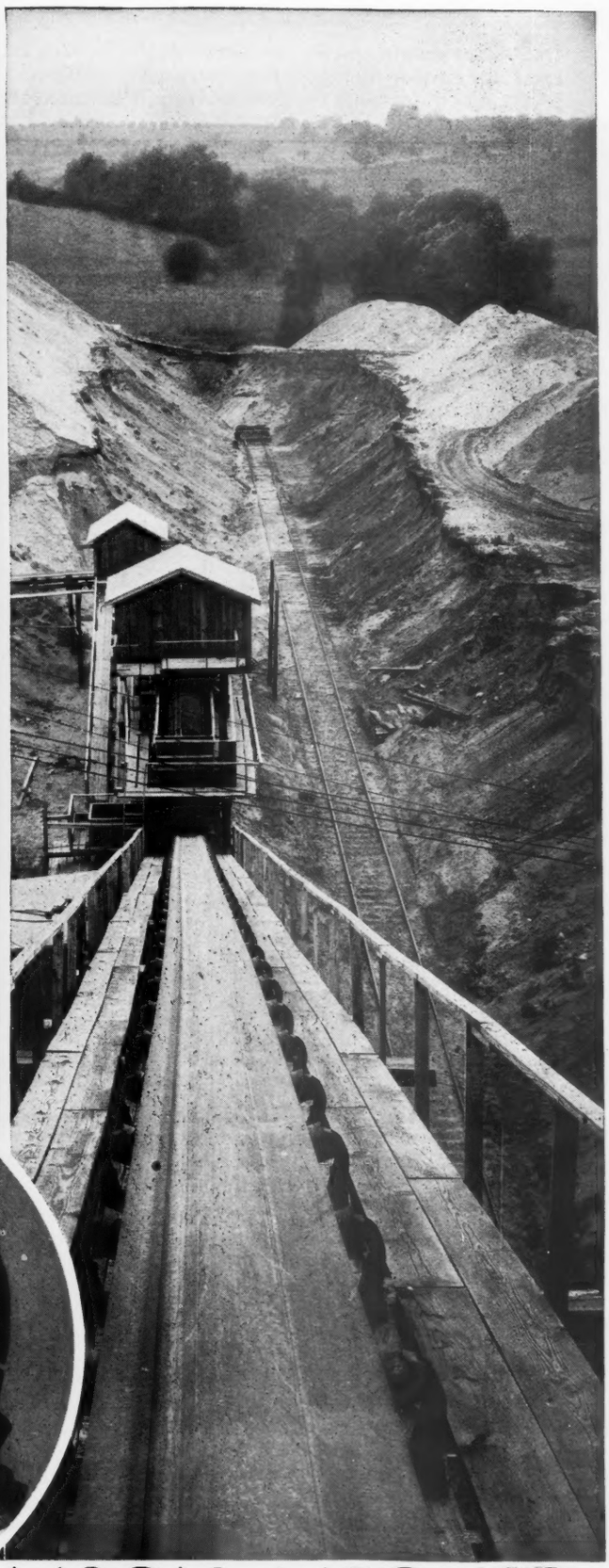

STEPHENS-ADAMSON MFG. CO.

Los Angeles, California « « AURORA, ILLINOIS » » Belleville, Ontario, Canada

every belt conveyor deserves S-A carriers

Rates for display advertisements in the Broadcast Section are given below. If you want to buy or sell used equipment, if you want a job or need a man, advertise your wants in Pit and Quarry. Advertisement copy for publication in the next issue should reach our office within one week after the date of this issue.

RATES PER INSERTION	1 Inch	2 Inches	3 Inches	4 Inches	5 Inches	6 Inches	8 Inches	9 Inches	10 Inches	12 Inches	15 Inches	20 Inches	30 Inches
1 Insertion	$ 3.75	$ 7.25	$10.75	$14.25	$17.75	$21.25	$28.25	$31.75	$35.25	$42.25	$ 56.25	$70.25	$105.00
2 Insertions	3.75	7.25	10.70	14.20	17.65	21.15	28.15	31.65	35.15	42.15	56.15	70.00	104.00
3 Insertions	3.75	7.20	10.65	14.15	17.55	21.05	28.05	31.55	35.10	42.05	56.05	69.75	103.00
4 Insertions	3.70	7.15	10.60	14.10	17.45	20.95	27.95	31.45	35.00	41.95	55.90	68.75	101.00
8 Insertions	3.65	7.05	10.50	14.00	17.25	20.75	27.75	31.25	34.80	41.75	55.70	67.50	98.00
13 Insertions	3.60	6.95	10.40	13.90	17.05	20.55	27.55	31.05	34.60	41.55	55.55	66.25	94.00
26 Insertions	3.50	6.75	10.20	13.70	16.65	20.05	27.05	30.65	34.20	41.05	55.05	64.00	88.00

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It Pays to Advertise in PIT AND QUARRY

"We have had nine inquiries from our advertisement in your paper at this time."—PUTNAM SAND CO.

COMPLETE SERVICE PUBLISHING COMPANY

538 South Clark Street CHICAGO

Machinery for Sale

SPECIALS
1—6′x22″ Hardinge Mill.
1—24″x12″ Farrel Crushing Rolls
1—10″x16″ Buchanan Jaw Crusher

CRUSHERS

Crushing Rolls

2—8″x5″, 2—24″x12″, 1—24″x14″, 1—30″x12″, 1—30″x16″, 2—36″x16″, 2—42″x16″, 1—54″x24″.

Gyratory

All size from No. 2 Reduction to No. 12K.

Jaw

1—2″x6″, 1—6″x3″, 2—8″x10″, 1—6″x15″, 2—9″x15″, 1—11″x22″, 2—12″x24″, 1—18″x36″, 1—24″x36″, 1—60″x84″.

Rotary

Two No. 0, two No. 1, one No. 1½, and one No. 2 Sturtevant Rotary Fine Crushers.

Ring Roll

One No. 1 and one No. 2 Duplex Sturtevant ring roll mills.

Ball and Tube Mills

3′, 4′, 4½′, 5′, 5½′, 6′, 8′ Hardinge Mills and Tube Mills.

DRYERS

One 3′x30′, Three 4′x30′, One 4½′x30′, One 5′x40′, One 5½′x40′, One 6′x60′, One 7′x60′ and One 8′x80′ Direct Heat Rotary Dryers, One 5′x25′, One 6′x30′, Two 8′x80′ Ruggles Coles type "A" and One 5′x30′ indirect heat rotary dryer.

KILNS

3′x15′, 4½′x36′, 6′x60′, 6′x70′, 6′x100′, 6′x120′; 1—6½′ Rotary Batch Roasting Furnace.

MILLS

Two 33″ Fuller Lehigh Mills.
1 No. 0000, 1 No. 00, 2 No. 1, 2—4 Roll, and 1—5 Roll Raymond.
Swing Hammer Mills, Griffin Mills, Attrition and Cage Mills.
Air separators, Screens, Elevators and Conveyors, Sand Washers and Classifiers.
1—Double deck, double surface 6′x5′ Hummer Screen.

The Heineken Engineering Corp.
Industrial Engineers
117 Liberty St., New York City
Barclay 3570-3571

SWEDISH HOLLOW DRILL STEEL
GUARANTEED 100% PERFECT
Considerably below market prices.
20 ton ⅞-in. Hexagon.
50 ton ⅞-in., 1-in., 1⅛-in., 1¼-in., and 1⅜-in. Round, Hexagon and Quarter Octagon.
MARINE METAL & SUPPLY CO.
167 South St., New York City

FOR SALE

SPECIALS
1—48″x42″ Traylor Jaw Crusher.
1—42″x40″ Allis-Chalmers Jaw Crusher.
1—36″x28″ Traylor Bulldog Jaw Crusher.
1—36″x24″ Allis-Chalmers Jaw Crusher.
1—36″x24″ Farrel 15-B Jaw Crusher
1—50″x22″ Champion Jaw Crusher
2—6″ McCully Fine Red. Crushers, Rebuilt.
4—4x16, 4x20, 40″x20′ Allis-Chalmers Screens.
2—8′x60′ Ruggles-Coles Rotary Dryers.
3—6′6″x40′ Vulcan Rotary Dryers, Overhauled.
3—5′6″x20′ Smidth Tube Mills, silex.
1—4′x7′ Kennedy Steel Lined Rod Mill.
2—36″x16″ Type B Allis-Chalmers Rolls.
1—36″x16″ Traylor Crushing Rolls.
3—6′x22″, 6″x30″ Hardinge Ball Mills.
3—2-5 roll Raymond High Side Mills.
1—42″ Fuller Lehigh Mill—NEVER USED.
2—42″ Fuller Lehigh Mills.
1—Type 39 Heavy Duty Tyler Screens.
2—36″x24″, 42x36 Jeffrey Swing Hammer Mills.

Jaw, Gyratory, Roll Crushers, all sizes, types.
Rotary Kilns, Dryers, all sizes, types, not listed above.
Swing Hammer Mills, all sizes, types.
PULVERIZERS—Raymond, Hardinge, Sturtevant, Kent, Griffin, all sizes and types—Ball, Tube and Pebble Mills, Air Separators.

We have just issued latest list No. 10
Request your copy

Consolidated Products Co. Inc.
17-19 Park Row, New York City
Barclay 0600

Shops and Yards at Newark, N. J., cover six acres.

WE WILL BUY YOUR SURPLUS MACHINERY

Check HAISS As Your Source of GOOD FACTORY REBUILT EQUIPMENT

FACTORY REBUILT CLAM SHELL BUCKETS
1—Haiss 1¼ yd. bucket, "Contractor" type
1—Haiss ½ yd. "HI-POWER" Digging bucket with teeth
2—Haiss ¾ yd. "CONTRACTOR" type clamshell buckets
1—Blaw Knox ¾ yd. Lever Arm with or without teeth
1—Haiss 1 yd. "ROUND BOWL" Snow bucket
1—Hayward 1½ yd. "Class E" Clam-shell Bucket
1—Haiss 1½ or 1⅝ yd. Round Bowl clam-shell Bucket
1—Haiss 2½ yd. "HI-POWER" type Clamshell bucket
1—Owen ¾-yd. Digging Bucket with teeth
1—Haiss 2½-yd. Digging or Dredging Bucket.

FACTORY REBUILT TRUCK LOADER
1—Haiss Model 26 Creeper Path Digging Truck Loader equipped with 37 H.P. Waukesha engine.

GEORGE HAISS MFG. CO., INC.
142nd St. and Rider Ave., New York City

DERRICKS
1—15-ton 100-ft. boom Terry all steel stiffleg.
1—5-ton Insley Steel Guy 95 mast, 85′ boom, 12′ Bull-wheel bucket operating.
1—5 ton 50′ boom steel stiffleg.

HOISTING ENGINES
1—80 H.P. Lidgerwood, 2-drum 80 H.P. A.C. 440 v. 3 ph., 60 cy. Motor, Controller and Grids.
1—75 H. P. National Triple Drum Independent Motor Driven Swingers and Banked Lever Controls, 3 phase, 60 cycle, 440 volts.
1—60 H.P. National 3-drum Elec .with Swinger.
1—8¼x10 Lidgerwood Triple Drum, A.S.M.E. Boiler.
1—10x12 3-drum Clyde Skeleton with Swinger.

BROAD GAUGE CRANES
1—110-ft. Boom, Electrically Operated Industrial Broad Gauge Crane, equipped with 5-yd. Clamshell Bucket. Like new.
2—Link-Belt Tower mounted, 90′ boom, steam operated full revolving Gantry cranes, mounted on 30′ towers

GASOLINE SHOVELS AND CRANES
1—2-yd. Marion Model 37 Cat. Steam Shovel, new 1927, 15 months service. Wonderful condition.
1—1 cu. yd. Link Belt Combination, 50-ft. boom.
1—¾-yd. Complete Shovel Front (boom, dipper, and dipperstick) for Model 206 P. & H.

CARS
15—4 cu. yd. Koppel 36″ ga. Steel Center Sill.

LOCOMOTIVES
1—14-ton Plymouth, 36-in. gauge, Gasoline.
1—25-ton Baldwin std. ga. Gas. Has seen about 4 mos. service.
1—11x16 Davenport Std. Ga. Saddle Tank.

TRACTORS
2—Caterpillar "60."

B. M. WEISS
1324 Widener Bldg., Philadelphia, Pa.

4—36-in. gauge Electric Locomotives.
36—4-yd. Heavy Steel Stone Skips.
1—458-ft. Ing.-Rand Air Compressor.
1—610-ft. Ing.-Rand Air Compressor.
2—1½-yd. 36-in. Gauge Cars.
3—1-yd. 24-in. Gauge Cars.
1—P. & H. 206 Crane, 38-ft. Boom.
2—Byers Bearcat Cranes.
1—200 H.P. Thomas Electric Hoist.
1—500 H.P. Corliss Engine 28 x 42.
2—Linn Tractors, 5-yd. capacity.

J. T. WALSH
500 Brisbane Bldg. Buffalo, N. Y.

FOR SALE

IMMEDIATE DELIVERY

4—24-in. Gauge, Plymouth gear-driven Locomotives.
3—Miles of 24-in. gauge, 20-lb. Koppel Track.
12—Right and left Switches, 24-in. gauge.
28—Cars, 10,000-lb. capacity.

This equipment almost as good as new and priced low for quick sale.

THE DAY & MADDOCK CO.
8201 Almira Ave. S.W. Cleveland, O.

QUARRY AND GRAVEL EQUIPMENT FOR SALE OR RENT

CARS

68–Koppel 5-yd., 36-in. Gauge, 2-way Dump.
17–Continental 5-yd., 36-in. Gauge, 2-way Dump.
9—Standard Gauge Flat Cars, Cap. 60 to 100,000 lbs., lengths 36 to 40 ft. Full M.C.B. with Air Brakes.
22–Koppel, 36-in. ga. double truck flat cars, 14 ft. 6 in. long by 4 ft. 4 in. wide.
8—Easton Standard Gauge Flat Cars, capacity 6 tons; platform 10 ft. long x 6 ft. wide.
8—Easton 24-in. gauge, 3-ton capacity, platform 5-ft long x 3-ft. 6-in. wide.

CONVEYORS AND ELEVATORS

1—Belt Conveyor, 24-in. wide by 120-ft. centers.
1—Northern special conveyor for handling concrete 30 in. wide by 80-ft. centers.
2—Barber-Greene, 24-in. belt by 70-ft. centers, with steel frame, style and No. 97801.
1—Barber-Greene Portable Conveyor, 18-in. Belt. 60-ft. centers with 15 hp. Le Roi gasoline engine.
1—Northern portable, 24-in. belt by 36-ft. centers, with 4-cylinder Le Roi, 15 H. P. gasoline engine.
1—Jeffrey Portable Belt Conveyor, 16 in. wide by 30-ft. centers, with 3½-hp. Hercules gasoline engine.
2—Link-Belt Bucket Elevators, 82-ft. centers; with 12x7-in. buckets, mounted on chain.
1—Link-Belt cement bucket elevator No. 30, with boot, bucket, shaft, etc., for 50-ft. centers, No. W-7084.
3—Weller No. 3 stone and ore elevators, 50 to 65 ft. centers.

CRANES

1—Austin Wolverine, 12-ton capacity, with 50-ft. boom on full crawlers, gasoline operated.
1—Link-Belt gasoline, Model K-1, 10-ton, on full crawlers, with 50-ft. boom, shop No. K-1024.
2—Northwest 104, on crawlers with 40 or 45-ft. boom and equipped with fair leads. Shop Nos. 1061 and 2223.
2—Brownhoist No. 2 gasoline cranes, mounted on full crawlers, 10-ton capacity, with 40-ft. boom and with Climax, 4-cylinder, Model TU, gasoline engine. Shop Nos. 9964 and 9859.
1—Brownhoist No. 1, 7-ton capacity, with 35-ft. boom, full crawlers, gasoline.
1—Austin No. 5, gasoline, with 36-ft. boom, on full crawlers.
1—Byers Bear Cat on crawlers, with 30-ft. boom. Shop No. 2796.
1—Byers, Model 10, steam on half crawlers, with 30-ft. boom.

SPECIAL
10-Inch Dredge Equipment

1—10-inch AMSCO manganese pump, belt connected to 300 H. P. Westinghouse, type CW, 3 ph. 60 cy. slip ring motor with 16-speed controller and all necessary resistors and oil switch.
1—35 ft. Swintex suction screen ladder with manganese chain, diggers and nozzle end, driven by 15 H. P. 3 ph. 60 cy. alternating current motor.
1—Clyde double drum hoist, belt drive, with 15 H. P. 3 ph. 60 cy. alternating current motor.
1—5x5-inch Barnes double action priming pump, with 5 H. P., 3 ph. 60 cy. alternating current motor.
1500 ft. quadruple .0000 electric cable.
300 ft. 10-in. dredge pipe.
Quantity suction and discharge sleeves, also fittings.
All necessary blocks for hoisting operation. This equipment is for barge mounting, but without the barge.

CRANES (Continued)

2—Type "B" Erie crane or dragline, with 40-ft. boom and ¾-yd. bucket, also with steam shovel boom and ¾-yd. dipper. Shop Nos. 3900 and 3047.
1—Industrial Brownhoist, Type CC, gasoline on crawlers, combination crane and shovel, ½-yd. dipper, 36-ft. boom.

CRANES (Locomotive)

1—Ohio, 30-ton, standard gauge, 50-ft. boom. Shop No. 3367.
1—Ohio, 25-ton, standard gauge, 8-wheel, with 50-ft. or 60-ft. boom. Shop No. 1780.
2—Browning No. 8, 25-ton, with 50-ft. booms; 8-wheel MCB. Shop Nos. 2143 and 2016.
1—Browning No. 2, 4-wheel standard gauge, with 50-ft. boom. Shop No. 643. BARGAIN.

LOCOMOTIVES (Gas)

16—Gasoline locomotives, as follows: 4 Plymouth 14-ton, 36-in. gauge; 3—Vulcan, 8-ton, standard gauge; 5—Plymouth, 8-ton, 36-in. gauge; 2—Plymouth 7-ton, 24-in. gauge; 1—Plymouth, 7-ton, 24-in. gauge; Friction Drive; 1—Milwaukee, 7-ton, 24-in. gauge; 1—Burton, 6-ton, 24-in. gauge, Friction drive; 1—Whitcomb, 3½-ton, 24-in. gauge; 3—Brookville Fordson, 3-ton, standard gauge.
9—Whitcombs, 36-in. ga. 1—12 ton, 8—8-ton. Located in Florida.

LOCOMOTIVES (Steam)

1—Porter, 24-ton, cylinders 12x16, standard gauge, saddle tank, 4-wheel, with steam brakes. Shop No. 5093.
2—Vulcan, 20-ton, cylinders 11x16, standard gauge, 4-wheel, saddle tanks, steam brakes. Shop No. 1417 and No. 2159.

PIPE

2,600 ft. of 12-inch spiral pipe, slip joint and flange connections.

PUMPS

40—Centrifugal Pumps from 12-in. suction and discharge down to 2-in. belt drive and direct connected to A. C. electric motors.
5—Centrifugal belt driven dredging pumps: 1—Morris 12-in.; 2—Morris, 8-in.; 1—Morris manganese 6-in.; 1—Erie, 6-in.

SHOVELS (Steam)

1—Type 37 Marion full revolving steam shovel, on crawlers, 1¾-yd. dipper. Shop No. 5308.
1—Marion, Model 60, railroad type, with 2½ cu. yd. dipper, 25-ft. boom and 16-ft. dipper stick. Shop No. 2225.
2—Erie, type B shovels, with ¾-yd. dippers and equipped with 40-ft. crane boom, ¾-yd. clamshell bucket. Shop No. 3900 and No. 3047.
1—Marion, Model 21, steam shovel, on crawlers, ¾-yd. dipper. Shop No. 4196.

TRACK

10 miles of 36-in. ga. 25 lb. portable rivited track, 15-ft sections, 7 ties per section, located in Florida.

Send for list of Conowingo Equipment and our latest Stock List containing our complete Stock in our Chicago, Philadelphia and Pittsburgh Plants, of AIR COMPRESSORS, BOILERS, DERRICKS, DRILLS, HOISTS, PUMPS, ETC.

EQUIPMENT CORPORATION OF AMERICA

PHILADELPHIA
660 Horn Bldg., 1601 Chestnut St.
Phone Rittenhouse 6100

CHICAGO
1160 S. Washtenaw Ave.
Phone Seeley 5100

PITTSBURGH
860 Empire Bldg.
Phone Grant 6100

Conowingo, Md.
Box 86

PIPE

Rethreaded, reconditioned, guaranteed, suitable for all practical purposes, furnished with new threads and couplings, 400,000 feet in all sizes from 24″ to ¾″. Also large stock of spiral pipe, sizes 7″, 10″, 12″, 14″, 20″ and 24″. Large stock of valves and fittings, screwed and flanged. Can make attractive prices.

Marine Metal & Supply Co.
167 South St., New York City

LOCOMOTIVES

1—Baldwin 7½ ton 24-inch gauge.
2—Whitcomb 6-ton 24-inch gauge.

CARS

8—1½ yd. V-Shaped Koppel 24-inch gauge.

STEAM CRANES

Industrial 15-ton, 40-ft. boom.
Browning 20-ton, 46-50-ft. boom.
O. & S. 18-ton, 50-ft. boom.
Brown Hoist, 3-ton, 26-ft. boom.
American Hoist, 20-ton, 30-ft. boom.

TRUCK CRANES AND CRAWLER CRANES

HOISTING MACHINERY CO.
50 Church St. New York, N. Y.

SHOVELS or CRANES for SALE or RENT

Rental payments may apply on Purchase

1—Factory rebuilt LIMA "101" 1¼-cu. yd. capacity. This machine can be equipped with either shovel, chamshell, dragline, or drag shovel attachment. Very reasonably priced. Carries new machine guarantee. Located at Lima, Ohio.

1—**Orton** gasoline combination shovel and crane. ¾-cu. yd. capacity full revolving and full caterpillar type. Very reasonably priced. Located at Indianapolis, Ind.

1—**Osgood** ¾-cu. yd. steam combination shovel and crane, caterpillar mounting. This machine is in very good condition and is priced extremely low. Located at Peoria, Ill.

1—**Type "B" Erie** steam shovel, ¾-cu. yd. capacity. Caterpillar mounting. Excellent condition. Price reasonable. Located near Tamaqua, Penna.

1—**Northwest** gasoline clamshell 40-ft. boom. This machine is in good condition and is offered at a very attractive price.

We have both Steam and Gasoline Excavators ranging from ½ to 1½-cu. yd. capacity in various parts of the country that will be sold at extremely low prices or leased with leased payments made applying on purchase price.

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Charles F. Cohen

Lima Trust Bldg. Lima, Ohio

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1—70-C BUCYRUS SHOVEL, 2½ or 3-yard dipper, on caterpillars. Steam.

1—175-B ELECTRIC BUCYRUS COMBINATION DRAGLINE AND SHOVEL, 3-phase, 60-cycle, 440 volts, 3½-yard bucket.

1—18-B BUCYRUS SHOVEL, ⅞-yard dipper on full revolving caterpillars.

1—35-B BUCYRUS SHOVEL, Electric, full revolving caterpillars, 1½-yard dipper.

LOCOMOTIVES

1—14-ton, 9 x 14—36-inch gauge—VULCAN SADDLE TANK.

1—15-ton, 10 x 14—36-inch gauge—VULCAN SADDLE TANK.

10—21-ton, 11 x 16—36-inch gauge—VULCAN SADDLE TANK.

DUMP CARS

8—8-yard WESTERN—36-inch gauge—2-way side.

8—8-yard KERBAUGH—36-inch gauge—2-way side.

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2—100 H. P. LOCOMOTIVE TYPE.

1—32 H. P. LOCOMOTIVE TYPE stationary.

1—JOHNSTON BROS. VERTICAL, No. 2224, 48-inch diameter, 8 feet high.

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5—30,000-gallon Fir tanks.

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1—MODEL 21 DENVER on tripod.

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Buy an E. E. D. reconditioned or rebuilt excavator and be free from the usual grief and trouble experienced wtih used equipment.

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30-ton American 4-wheel saddle tank.

33-ton Vulcan 4-wheel saddle tank.

50-ton American 4-wheel saddle tank.

60-ton Porter 6-wheel saddle tank.

50-ton Baldwin 6-wheel switcher.

70-ton American 6-wheel switcher.

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25-ton 8-wheel Browning, 50 feet boom.

15-ton 8-wheel Link-Belt, 50 feet boom.

CARS

16-yard K&J, air dumps; 10 of these.

20-yard K&J, air dumps; 10 of these.

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Traylor 36x42 Jaw with Feeder.
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Traylor Jaw 60x84.
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Byers Bearcat Crane 28-ft. Boom,
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1—40-ton cap. LINK-BELT K-55, GASOLINE Crawler, new 1929.

1—17½-ton cap. P. & H. Model No. 700, GASOLINE Crawler, new 1927.

2—15-ton cap. NORTHWEST No. 104, GASOLINE Crawler, new late 1927.

1—12½-ton cap. INDUSTRIAL, GASOLINE Crawler, 50-ft. Boom.

LOCOMOTIVE

1—18x24, std. gauge, VULCAN, 64-ton, 6-wheel Saddle Tank; new 1922, new boiler, 190 lbs.; airbrakes.

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1—41-B BUCYRUS-ERIE, STEAM Crawler, new 1928, 1¼ yd.

1—MARION 21, ELECTRIC Crawler, ¾ yd. Shovel; 40-ft. Crane attachment; used few months.

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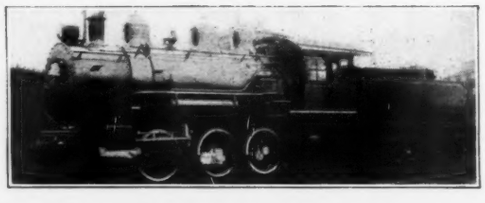

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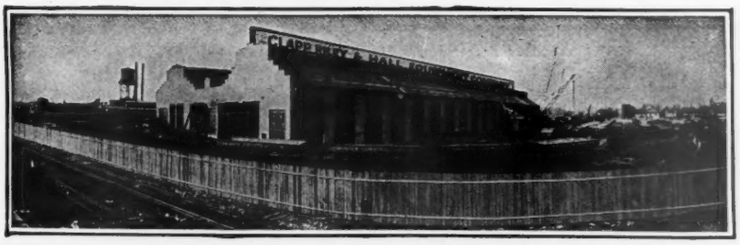

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CARS — RAIL

1½ and 1-yd.x24 and 36-in. gauge V dump Cars; 250—1½-yd. Western and Austin 2-way Side Dump Cars, 24, 30 and 36-in. gauge;
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Large quantities of rail, track accessories, portable track; bridge girders of all sizes.
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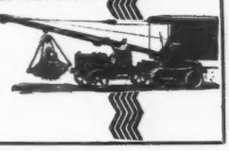

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Erie Caterpillar Steam Shovel, Shop No. 2885, high lift, capacity ¾ yd., price $3200.00, f. o. b. Detroit.

O. & S. Caterpillar Gasoline Shovel, ½ yd. capacity, price $2200.00, f. o. b. Detroit.

40-ton Browning Locomotive Crane, 8 wheel, M. C. B., 80-ft. boom, boiler A. S. M. E. Real low price.

P. & H., Model 208, Caterpillar Gas Crane and Dragline, capacity 1¼ yd. Price $3800.00, f. o. b. Detroit shipping point.

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Bucyrus Electric Cat. Drag, 1½ yd.
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50 Ton Saddle Tank Loco. New 1922.
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SHOVELS, CRANES AND DRAGLINES

2—½-yd. Speeder gas cat. Shovels, 1 with dragline equip.
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1—½-yd. Universal Truck Crane, ex. cond.
1—1-yd. Koehring No. 1 Comb. Shovel and Crane, 40-ft. boom.
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4—½, 1, 1½ and 2-yd. Slackline and dragline scraper outfits.
1—2-yd. Monighan Diesel Dragline, 60-ft. boom.

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2—7-ton, 24-36-in. ga. Milwaukee Gas geared type.
2—22-30-ton Davenport & Rogers, std. ga., 4 wh. Saddle Tank Locos.
11—1½-yd., 24-in. ga. Western Dump Cars.
32—6 and 12-yd. std. ga., 2 way Dump Cars, steel underframe.
20—Std. ga., 25-yd. all steel, 100,000 cap. Ore Cars.
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2—18-in. and 24-in. Belt Conveyors from 150 to 200-ft. centers.
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1—Marion Model 41 Steam Shovel on railroad trucks, 1¾ dipper, used very little, a bargain for quick sale.
1—Thew Type O Steam Shovel on traction wheels, fine condition mechanically.
1—McMyler No. 2 Crane with shovel attachment.

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P. & H. Cat. Gas Shovel, high lift, ¾ yd. dipper. Also has crane and dragline equipment. Will sell all or separate.
Dragscraper Outfit, consisting of 3-drum hoist, with 120-hp. gas motor, 1½ yd. bucket, cable, fittings, etc. 2 Milwaukee 7-ton Gas Locos., 24-in. ga. track, and 1½ yd. dump cars.

LEONARD F. SMITH
LaPorte, Ind.

SLACKLINE EXCAVATOR BARGAINS

1—1½ cu. yd. Slackline Cableway Excavator complete with elec. motor and hoist, steel mast, guys, cables and blocks.
1—2 cu. yd. Slackline system as above but with steam hoist and Erie boiler.
This equipment in excellent condition. Immediate shipment. Write for prices.

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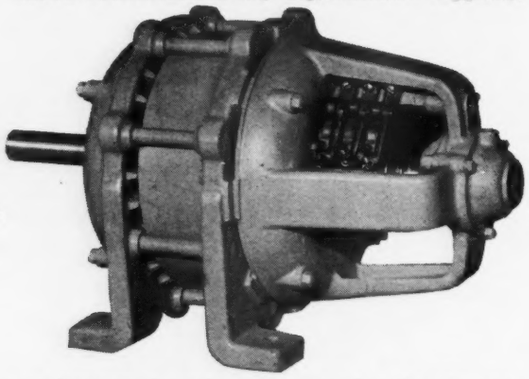

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1100 H. P. SLIP RING MOTOR

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Immediate Shipment

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150 HP Fairbanks-Morse Diesel Engine with 2 Yd. Sauerman Slackline or Cableway Outfit. Steam Outfit same size.
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6-in., 8-in., 10-in., 12-in. and 20-in. Dredge Pumps.
All sizes Elect. Hoists. Air Compressors, Pumps, Boilers, Crushers, Screens, Loaders, Bins, etc.

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1—26-inch. Traylor Gyratory.
1—No. 37 Kennedy Gearless Gyratory.
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1—14x36-in. Cedar Rapids Jaw Crusher.
1½-yd. Sauerman Electric Slackline Cableway, Complete.
2—No. 104 Northwests with Pull Shovel.
1—D.D. Belt Hoist.
1—11 HP. D.D. Steam Hoist.
1—5-ton, 70 ft. steel guy Derrick.

Locomotives, Cars, Cranes, Slacklines.

Write or wire us for any Equipment you want.

T. J. LANE COMPANY
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IN A-1 CONDITION

2—8-ft. x 20-ft. Bruckner Type Rotary Roasters.
6-ft. x 40-ft. Vulcan Rotary Kiln.
7-ft. x 100-ft. Rotary Kiln.
7½ Gyratory Crusher.
15—30-in. Gauge Rack Dryer Cars.
2—14-in. x 6-in. Jaw Crushers.
1—300 K. W. Oil Engine Generator Unit.
1—6-ft. x 125-ft. Self-Supporting Steel Stack.

THE EQUIPMENT SALES CO.
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STONE CRUSHING EQUIPMENT

2—No. 36-B Direct Drive Gyratory Reduction Crushers complete. Motor, Compensator, Ammeter, Low-voltage Release and Overload Relay, including a lot of spare parts.

These machines can be seen in operation.

1—Main Shaft Nickel Steel for No. 10 McCully Gyratory Crusher with Steel Shaft Center and Nut.

1—Cast Steel Spider for same worn, would be suitable for a spare.

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150 H. P. Fairbanks-Morse Oil Engine. Complete with air starter and connected to 125 K. V. A. 3 phase, 60 cycle, 230 volt, generator. A complete oil power plant. A-1 condition.

Now generating power for a gravel plant located in Wisconsin and comprising:

60 H. P. DD hoist.
Sauerman drag scraper, ¾ yd.
70 feet x 18 inch belt bucket elevator.
24 inch pan feeder.
7 inch x 10 inch Blake jaw crusher.
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Two Hummer vibrating screens.
Two Sand wash boxes (log type).
4 inch Centrifugal pump. 400 feet 6 inch pipe.
Complete with motors, bin gates and chutes.

A complete gravel plant and power unit in excellent condition.

Will sell gravel plant and power plant as a unit or separately.

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SHOVEL-CRANE COMBINATION

1¼ to 1½ yd. Shovel and Crane Combination with Clamshell. Should like to hear direct from owners. Give full particulars, year, model, motor, condition, where inspection can be made.

MIDWEST GRAVEL CO.
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ROTARY CEMENT KILN

8-ft. x 80-ft. Rotary Cement Kiln. Please state condition, price and where located in first letter. Address Box 305, Pit and Quarry, 538 S. Clark St., Chicago, Ill.

WANTED—CRUSHER

No. 1½ Open Door Sturtevant Crusher, must be in good condition and cheap. Give condition, where located and price.

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WANTED

Cranes and shovels; locomotives and cars, compressors and crushers; gas and electric hoists; derricks, slack line and drag scraper outfits; gas road rollers and pavers; floating derricks, dredges, scows, etc.

Commission will be paid party, other than owner, giving first information on available equipment, as listed above, that I purchase. Said party to understand that no commission will be paid where equipment has been previously offered me. Amount of commission to be agreed upon before inspection. Write separate letter for each type machine offered. This offer expires June 1, 1930.

J. T. WALSH
500 Brisbane Bldg. Buffalo, N. Y.

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Mead-Morrison, 3-drum Hoist with Swinger, 52 HP G. E. Motor, 220 V. 3-60, with or without Guyed Derrick 80 ft. mast, 70 ft. boom, 2 yd. bucket.

WANTED

No. 10 Gyratory Crusher.

H. J. KOONTZ,
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Crushers, Elevators and Screens

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DRY GRINDING COMPEB MILL

Prefer 6 x 15 ft. with grid, division heads and Style B Swing Type Feeder. For direct connection with motor. Give full specifications, make, condition, location and best cash price. Address Box 309, Pit and Quarry, 538 S. Clark St., Chicago, Ill.

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1—24-in. Symons Disc Crusher.
2—30-in. Symons Cone Crushers.
2—6D Allis-Chalmers Gyratory Crushers.
1—50 H.P. Portable Scotch Marine Boiler.

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42" Mammoth Gyratory Crusher

Rebuilt, over $17000 worth new parts.
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Two of the Warner Company, Philadelphia, fleet of 63 Clinton Conveyor-Conditioners, delivering concrete to a foundation job in the congested central district.

"Clintonized" Concrete Is Easier to Sell

Diagram shows how Clinton Conveyor-Conditioners eliminate in transit most of the air entrained by mixing.

IT'S easy to show your customers why it is to their advantage to use pre-mixed concrete that has been conditioned in a Clinton Conveyor.

The tremendous appeal of pre-mixed concrete, to both the contractor and the engineer, is engaging the attention of sand and gravel producers everywhere. Let us show you the advantage of "Clintonizing" your concrete.

First: Being centrally mixed, with accurate weighing batchers and measuring tank, "Clintonized" concrete is naturally **uniform.**

Second: As the Clinton tank is rotated steadily by a separate engine, there is **no segregation,** even of a wet mix.

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Fourth: The high quality and reliability of "Clintonized" pre-mixed concrete make it unnecessary to reduce the aggregate to offset poor mixing conditions. "Clintonized" concrete **costs less.**

The simplicity and fine construction of Clinton Conveyors make delivery costs extremely low.

CLINTON MOTORS CORPORATION Reading, Penna.

"CLINTONIZING"
(PROCESS PATENT APPLIED FOR)

The Final Touch to Ready Mixed Concrete

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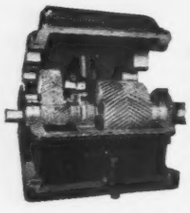

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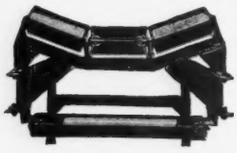

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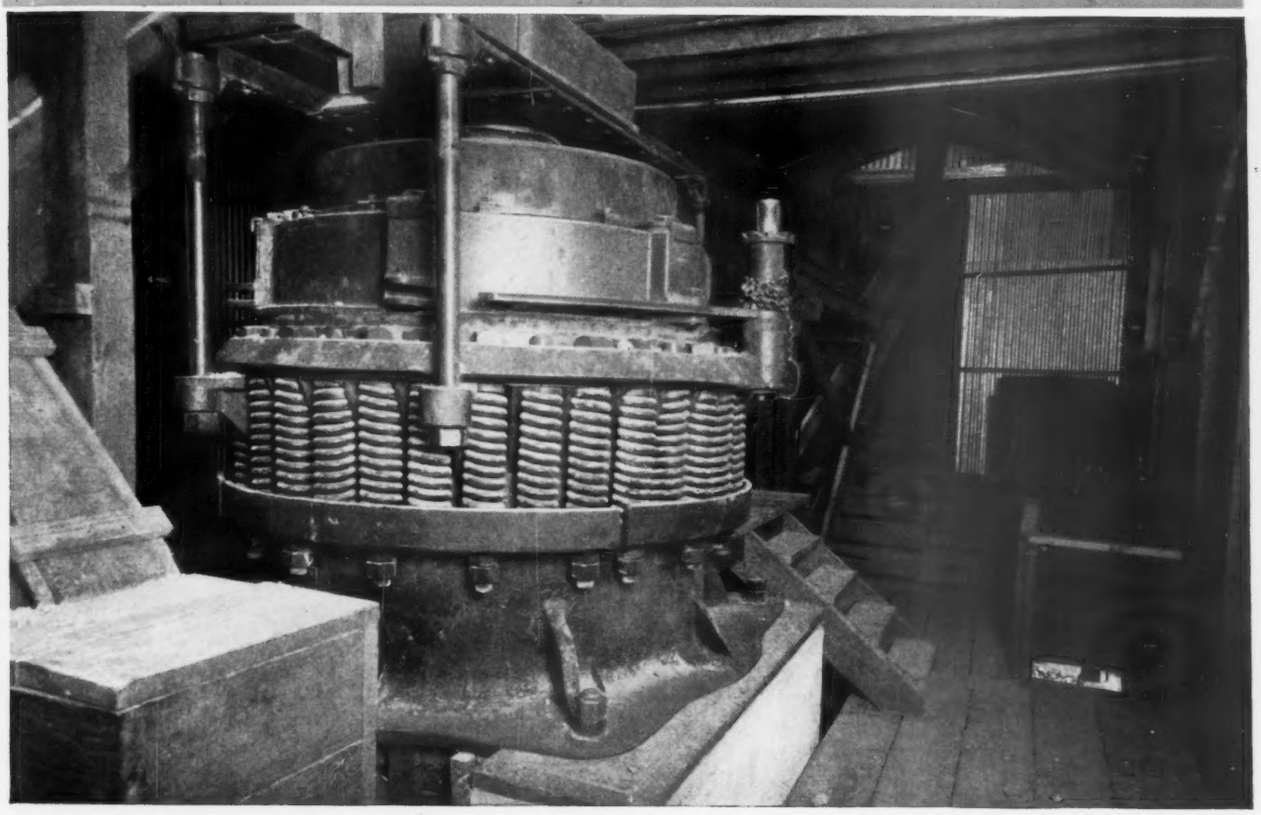

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There are five sizes to choose from
A size for every plant

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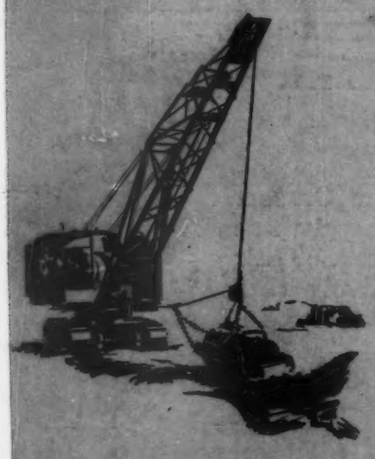
This half-yard shovel is bigger than its rating

READILY CONVERTIBLE TO CRANE DRAGLINE SKIMMER OR HOE



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½ cu. yd. to 3½ cu. yds.
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A-522